MODEL AIRPLANE NEWS

January 1998

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MODEL AIRPLANE NEWS

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Member Audit Bureau of Circulations

PRINTED IN THE USA

JANUARY 1998 • VOLUME 126, NUMBER 1

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ON THE COVER: *this Jean Oldham drawing first appeared on the cover of* Model Airplane News *in February 1930.*

BONUS!

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Construction

Department

Reviews

Columns

EDITORIAL

by LARRY MARSHALL

ONWARD TO '98

Here we are at the end of 1997. This year has brought some changes to *Model Airplane News*; we've added more color and have worked hard to provide even better flight shots, as we know from your letters that you like them. We've also given serious thought to maintaining a balance between large and small aircraft and have provided construction articles on both big and small planes.

We've added several regular features, too. Our "Readers' Gallery" celebrates great modeling efforts with photo presentations of special model aircraft. We've also added three new columns. We're fortunate to have Don Edberg talking to you about programmable radios and Chris Chianelli discussing engines, fuels, glow plugs and such. Jim Ryan has been providing insights into computer use in modeling. From the mail we're getting, it seems these guys are really hitting the mark. We've also improved our coverage of the world of sailplanes with folks like Dave Garwood, Dave Sanders and Mike Lee providing information about the silent fun part of our hobby. We continue to work hard to provide articles showing you how to build, fly and enjoy model aircraft.

1998 will bring even more changes. First, we're broadening our event coverage to showcase AMA combat, autogyro competitions, pylon racing and IMAC events. We've also started a column on electric flight, and another will start soon on building and flying giant-scale airplanes.

It's admittedly difficult finding pages for all these things. It seems that the job of an editor is similar to that of a shoe salesman: trying to fit size 10 feet into size 8 shoes. Nevertheless, we continue to try. The "secret" to our ability to bring you all this great stuff doesn't have much to do with us, though. We're able to print, and you're able to read all these great articles because of the modelers—our authors—who are willing to give up some of their precious building and flying time to tell us what they know and to show us what they do. It is truly my pleasure to be able to work with them as they share their expertise.

Greg Hahn poses next to his AMA Nationals winning B-25, built by enlarging Nick Ziroli plans. This issue presents Greg's first column with us and features a discussion of enlarging aircraft.

WARBIRDS, SMALL STEPS AND OTHER FUN STUFF

This month, we rely upon Jim Ryan to take us to the AMA Nationals. I've got to tell you a story about Jim, his dedication to this hobby and to telling you about it. Jim had agreed to cover this event, and then found he needed gall bladder surgery. That operation occurred on a Thursday; Jim covered the AMA Nationals for us (in spite of my urging him to stay home) that weekend. Jim's a trouper, and I sure am proud that he calls me "friend."

Deb Sharp headed down to Texas to show us that small planes—generally inexpensive models—are a lot of fun, with her coverage of the 10th Annual SMALL Steps Fly-In. There's a resurgence in interest in small planes driven, it seems, by the new Norvel engines and the Speed 400 electric motor craze that's sweeping the country. Whatever the reasons, small planes are cool again. Personally, I think that people are realizing that there's a lot of fun per buck to be had flying small models.

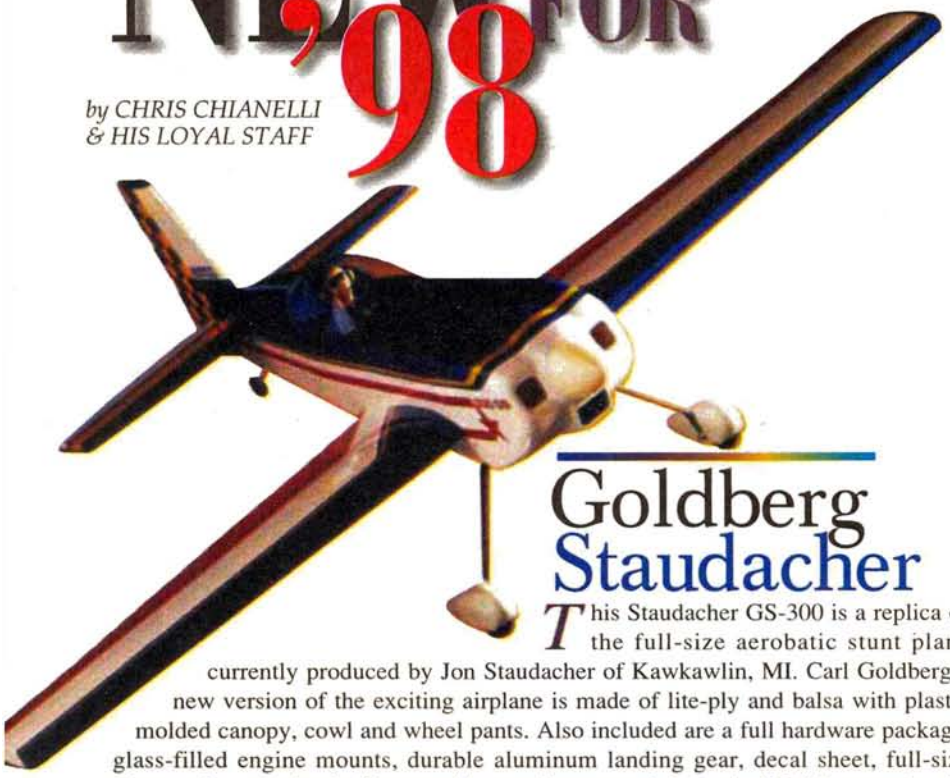
This month, we also welcome Greg Hahn to our pages. Greg is an interesting fellow who, when one of his Zenoahs fell off the firewall of his B-25 and into the bottom of the nacelle, completed the last five maneuvers of his Top Gun flight sequence and still scored well. He also just took top honors in expert class at the AMA Nationals. So he's got a thing or two to say about building and flying scale models and his relaxed, easygoing style comes through in his writing.

This month brings the first installment of a new electrics column, written by yours truly. I'll be directing this column toward questions asked of me at the field by glow flyers interested in getting into electrics but we'll also talk about neat products and techniques specific to building and flying electric airplanes. As with the rest of our magazine, where I go with the column and what gets covered will be dependent largely upon feedback from you guys, so write and let us know what you want to see. You can reach me at larrym@airage.com.

Special **AIR SCOOP**

NEW FOR '98

by CHRIS CHIANELLI & HIS LOYAL STAFF

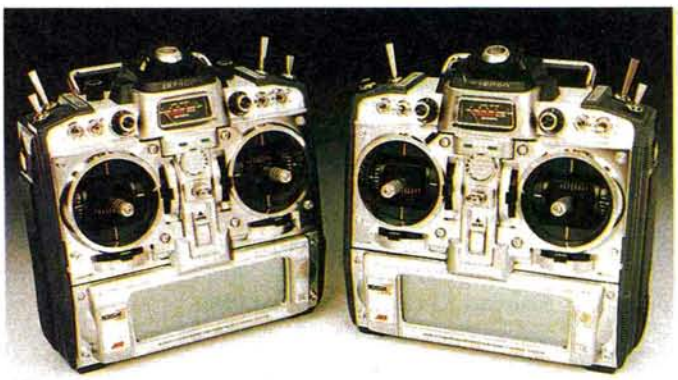


Goldberg Staudacher

This Staudacher GS-300 is a replica of the full-size aerobatic stunt plane currently produced by Jon Staudacher of Kawkawlin, MI. Carl Goldberg's new version of the exciting airplane is made of lite-ply and balsa with plastic molded canopy, cowl and wheel pants. Also included are a full hardware package, glass-filled engine mounts, durable aluminum landing gear, decal sheet, full-size plans and a completely illustrated instruction manual. In typical Goldberg style, the kit is a well-fitted wooden structure that is easy to assemble. While the airframe is fully capable of torque rolls, knife-edge and clean snaps, slow-flight characteristics are excellent. Specs: wingspan—60 inches; wing area—690 square inches; length—48.5 inches; flying weight—6.5 to 7.5 pounds; power .45 to .61 2-stroke or .46 to .80 4-stroke. For more information, contact **Carl Goldberg Models,** 4734 W. Chicago Ave., Chicago, IL 60651; **(773) 626-9550.**

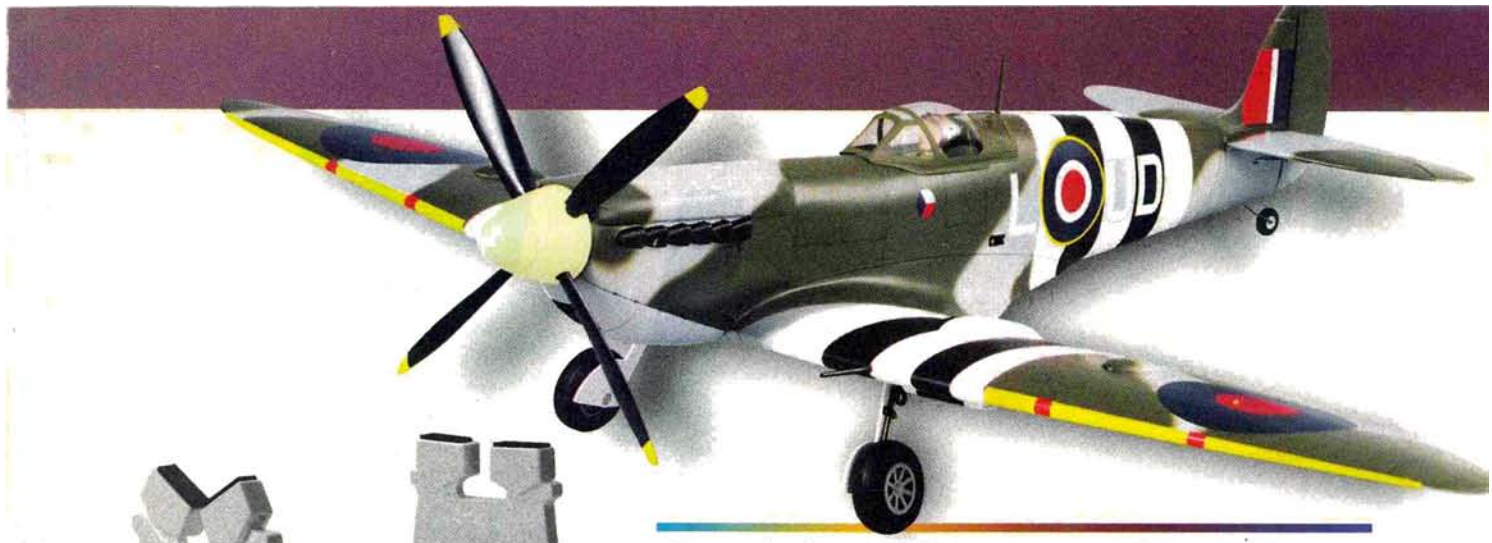
10SxII Next Generation

Known for its flexibility and reliability, the proven and user-friendly JR PCM-10Sx has been taken to the next level. The 10SxII features all-new Flight Mode Control, which, with the flip of a switch, allows the changing of complete flight profiles while in flight. The new Custom Response Rates enable experienced flyers to dial in the rate that's perfect for them, even if it involves different rates on each side of neutral. To match the SxII's enhanced flexibility, JR has developed the new 950S receiver. According to the distributor, Horizon Hobby, independent testing shows the 950S provides the highest protection possible against both model-induced and environmental interference. The aircraft version of the 10SxII includes four of JR's 4131 high-torque servos while the helicopter version includes five. Both systems utilize genuine Sanyo cells in their 1400mAh battery packs. For more information, contact **Horizon Hobby Distributors,** 4105 Fieldstone Rd., Champaign, IL 61821; **(217) 355-9511.**



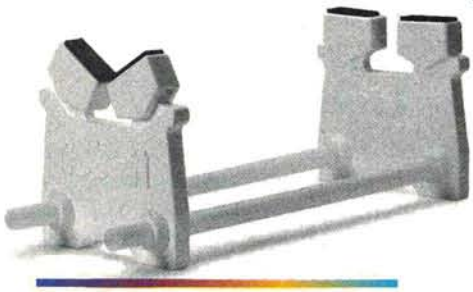
Norvel .15

Norvel, manufacturer of those very fine Russian ½A engines, has decided to expand its line to the .15 displacement. Available in both twin-ball-bearing and bushed versions, the new .15 has features that have made the ½A engines so popular. Features like: lightweight AAN cylinder/piston technology, rigid and lightweight investment-cast crankcase, Schnuerle porting and very low pricing. The .15 R/C (bushed) weighs 5.64 ounces with muffler, and the ball-bearing version weighs in at 7.41 ounces with muffler. For more information, contact **Norvel,** 2244 East Enterprise Pky., Twinburg, OH 44087; **(330) 425-3630;** fax (330) 425-3935.



Gold Edition™ Spitfire

Top Flite now add a beautiful 1/7-scale Spitfire Mk IX to their Gold Edition line. The Spit's airfoil was designed by Dr. Michael Selig, designer of the airfoil on the fabulous flying Gold Edition P-47 Thunderbolt. The Selig airfoil combined with the Spit's elliptical wing should make for a rock-solid performance at both high and low speeds. The kit features precision CAD-engineered wooden parts and many vacuum-formed ABS parts that enhance both scale detail and ease of building. Parts like wing fairings, exhaust stacks, machine-gun blisters, Mk IX clear canopy and many other details supply impressive scale realism. The kit includes an extensive hardware package complete with wire-rod-in-tube pushrods, photo-illustrated manual and full-size plans. A .60-size 2-stroke will fit entirely inside the aircraft's cowl and doesn't spoil the scale look of this vintage beauty. An optional scale cockpit kit is available; it's easy to install and includes seat, instrument panel and many other impressive details. Specifications: wingspan—63 inches; wing area—687 square inches; weight—7.5 to 8.5 pounds; wing loading—25 to 28.5 ounces/square foot; length—53 inches; engine required—.61 to .75 2-stroke or .70 to .91 4-stroke; 4- to 6-channel radio with five to seven servos. For more information, contact **Great Planes Model Distributors,** 2904 Research Rd., Champaign, IL 61826; **(217) 398-6300;** fax (217) 398-1104.

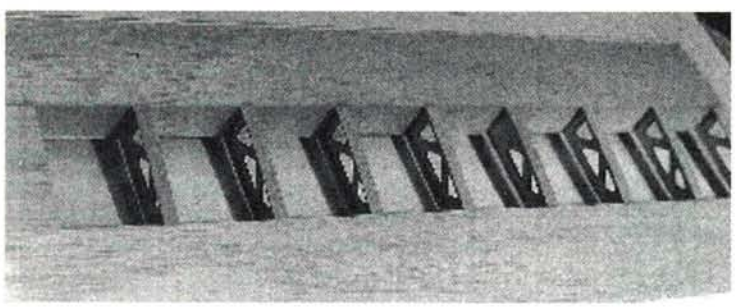


A stand for all models

According to Robart, their new Super Stand II is the only fully adjustable model stand and work station designed to fit all of your modeling needs. The support pads pivot to fit any contour, and the ends slide on sturdy double-walled plastic tubes to fit just about any length. This new Super Stand is more than just a model holder; it's also a work station. Being sturdy, light and unaffected by glow fuel, the Super Stand II is ideal for all your building, maintenance and transportation needs. This stand comes with soft rubber pads that grip your model and protect its fine finish. You can use it on airplanes of any size, from small gliders to giant-scale warbirds—even amphibians. For more information, contact **Robart Mfg.,** P.O. Box 1247, Dept. B, St. Charles, IL; 60174 **(630) 584-7616.**

Lanier All-Wood Pitts

Everybody—well, almost everybody—knows that the full-scale Ultimate Pitts is an all-out airshow machine. Now, what people need to know is that Lanier RC makes a high-quality line of all-wood kits that are reasonably priced and that a 1.20-size Ultimate Pitts has joined that line.



The new kit features laser- and CNC router-cut parts, simple bolt-on wings for fast setup at the field, interlocking lite-ply fuselage, balsa stringer turtle deck, ABS cowl and wheel pants, aluminum landing gear and a photo-illustrated instruction book. Specifications: wingspan—60 inches; wing area—1,112 square inches; length—58 inches; weight—10 to 14 pounds; recommended engine size—.91 to 1.20 2-stroke, 1.20 to 1.60 4-stroke, or 2.2 gas ignition. Requires at least a 4-channel radio. For more information, contact **Lanier RC,** P.O. Box 458, Oakwood, GA 30566; **(770) 532-6401;** fax (770) 532-2163.

NEW FOR '98

Enya 1.55R

That powerful workhorse the Enya 1.20R 4-stroke we all know and love so well has been given a displacement increase to 1.55ci. I can't tell you too much right now, but the 1.55R does seem to have retained the good features of the 1.20R. In particular, the carburetor, while probably increased in venturi inside diameter, seems to have the same design and choke features as the 1.20R—one of the best 4-stroke carburetors available, in my humble opinion. The 1.55R weighs 2.2 pounds. For more information, contact **Altech,** 80 Newfield Ave., Edison, NJ; 08818-7812; 908 **(225)-6144**.

Dave's Aircraft Works Semi-Scale Slope Soarer

Dave's Aircraft Works has just released a semi-scale ME-163 slope soarer made of the EPP foam that has made their other scale birds so popular. This one has a 49-inch wingspan and 432 square inches of wing area. The prototype weighs 22 ounces with standard servos. Contact Dave Sanders at **DAW,** 34455 Camino El Molino, Capistrano Beach, CA 92624; **(714) 248-2773;** email 104271.3352@compuserve.com.

Norvel Glow Plug

Norvel has just released a new glow plug that should cause small-plane fliers to smile. It's a replacement for their standard glow head that allows you to use standard glow igniters during starting procedures. Also, a redesign of the internals of the plug is yielding a 10 percent improvement in performance over its predecessor. For more information, contact **Norvel,** 2244 East Enterprise Pky., Twinsburg, OH 44087; **(800) 665-9575;** (330) 425-3630; website http://www.norvel.com.

Castle Creations Tiny Sprite-20 & Griffin-50

Castle Creations has released a tiny, and I mean tiny (0.9 x 0.7 inch), 20A, 16-cell speed control called the Sprite-20. Good for up to 16 cells, it also sports a BEC for use with fewer than 10 cells. Castle Creations is also about to release a 50A (continuous) controller that's not much larger (1.2x0.9 inches). The Griffin-50 is a 6- to 16-cell controller. Both controllers can handle 6 to 16 cells, have a brake, safe "power on" program, soft start and auto-shutdown if radio signal is lost. They also have a BEC option for use with fewer than 10 cells. They are available from **New Creations R/C,** P.O. Box 496, Willis, TX 77378; **(409) 856-4630.** You can also contact Castle Creations via email at pdelcast@idir.net.

(Continued on page 14)

NEW FOR '98

Digital Control! 7 to 36 cells

Astro's new 204D Digital Aircraft Speed Control was specially designed for large sport and scale models. The versatile 204D provides smooth linear speed control of motors as small as an Astro 035 and as large as an Astro 90. It weighs only 30 grams and measures 2.5x1.2x0.25 inches. Features include: digital microprocessor that needs no adjustment, safe-start feature that requires low-throttle command from the radio before the motor is allowed to start, and opto-coupler to minimize the occurrence of glitch-causing motor noise. For more information, contact **AstroFlight,** 13311 Beach Ave., Marina Del Rey, CA 90292; **(310) 821-0291.**

K&B .61 ABC R/C

K&B has introduced this Schnuerle-ported, lightweight (23 ounces) .61 for 1998. This twin-ball-bearing engine features true ABC piston-and-sleeve technology. The piston has four oil grooves cut in it to enhance sleeve/piston lubrication throughout the entire stroke. The carburetor incorporates a mixture disk for low- and mid-range tuning, while high-end adjustments are carried out by means of a remote needle-valve system. A large, tuned, expansion-chamber muffler is supplied as standard equipment. Since the head and cooling fins are machined from a single piece of bar stock, this engine should run quite cool. For more information, contact **K&B Mfg.,** 2100 College Dr., Lake Havasu City, AZ 86403; **(520) 453-3579;** fax (520) 453-3559.

Precision Routing with Dremel

The new Plunge Router Base from Bishop Cochran transforms the Dremel Multi-Pro tool into a miniature precision plunge router (also available for Ryobi Multi-Tool). The red-anodized base is beautifully machined from 6061 aluminum alloy. The base's mass and rigidity make intricate routing work possible with a Dremel tool. The plunge capability allows the bit to be lowered while the tool is running and alignment is maintained. The Plunge Router Base features: smooth vertical-screw adjustment, lock and depth stop, and screw-adjustable removable fence for circle-cutting tasks. The size, shape and construction of the router base make it easy to use with custom jigs. For more information, contact **Bishop Cochran,** 4326 SE Woodstock, #498, Portland, OR 97206; **email bishopcochran@IBM.net; fax(503) 777-0955.**

PT-19 ARF

Boeing's all-time favorite Army Air Force primary trainer, the PT-19, is now offered as a 90-percent-balsa, built-up ARF from Global Hobby Distributors. The kit features: joined wing halves, molded and painted fiberglass cowl, clear molded windshield, fuel tank, pushrods, steerable tail wheel, molded-composite engine mount, pre-formed landing gear, wheels and hardware. Specs: wingspan—56 inches; wing area—500 square inches; weight—5.4 pounds; engine required—.40 to .53 2-stroke. For more information, contact **Global Hobby Distributors,** 18480 Bandilier Circle, Fountain Valley, CA 92728-8610; **(714) 964-0827**; fax (714) 962-6452.

Big News from the Small World

According to Clancy Aviation, here's the lowest cost, most lightweight R/C system ever offered. This single-stick, 2-channel R/C system has an airborne weight of only 1.07 ounces (without battery pack). For only $119, you get a 27MHz Hitec transmitter, a Hitec 2-channel Shredder receiver weighing only .41 ounce, two Cirrus CS-20BB ball-bearing microservos that weigh .33 ounce each, a microswitch harness and a battery holder for four AAA cells. Options include a .44-ounce,. 3-cell 50mAh battery pack. A free set of plans for the Clancy 11-inch-wingspan "The Little Plane that Could" are included with each system sold. Available exclusively though **Clancy Aviation,** P.O. Box 4125, Mesa, AZ 85211-4125; **(602) 649-1534**; fax (602) 649-9040.

AirVista Two tools are all you need

From bench to flight line in a few hours—and a screwdriver and pliers are all you need! According to Great Planes, with the new AirVista, you don't need lots of time, tools or technical know-how to get an R/C model into the air. There's no drilling, no gluing, no waiting for weeks to see your airplane take shape. AirVista includes everything you'll need to build it. There's no need to buy that long list of accessories that add up really fast on the cash register. Just add a radio and engine, and your trainer is complete. But wait; there's more: a free video that prepares you for the work on the bench and on the flight line at the flying field; information such as radio-system components and how they work, basic engine setup and operation, parts of an R/C model and their roles in flight and flying-field procedures and etiquette. For more information, contact **Great Planes Model Distributors,** 2904 Research Rd., Champaign, IL 61826; **(217) 398-6300;** fax (217) 398-0008.

NEW FOR '98

Silent Dawn Patrol

Proctor Enterprises introduces this new, 1/6-scale electric SE5A designed by Duncan Hutson. The kit boasts CAD plans, CNC-machined parts throughout and a high degree of prefabrication, all of which should make building this true scale model a delightful experience. The designer states that many proven features from his larger scale designs have been incorporated into this latest model. Some of the kit's more notable features are: formed top decking with surface detailing, formed radiator grill, V8 cylinder block, belly pan and headrest. Also included are scale WW I wheels and full rigging set. Design prototype was powered by an Astro 40G on 20-2000mAh cells. Standard servos, receiver and battery are quite suitable for this 4-channel, 53-inch wingspan model. For more information, contact **Proctor Enterprises,** 25450 N.E. Eilers Rd., Aurora, OR 97002; **(503) 678-1300;** fax (503) 678-1342.

AIRWAVES

WRITE TO US! We welcome your comments and suggestions. Letters should be addressed to "Airwaves," **Model Airplane News,** 100 East Ridge, Ridgefield, CT 06877-4606; email **man@airage.com.** Letters may be edited for clarity and brevity. We regret that, owing to the tremendous numbers of letters we receive, we can not respond to every one.

SOFT MOUNTS FOR SMALL ENGINES

I've been reading your articles for quite a while and have always found your opinions dead on. I agree heartily with form following function in most aspects of this hobby.

After reading your article in the October 1997 issue of *Model Airplane News,* I decided to drop you a line. I, too, have always been a gear-head.

I'm writing to get your opinion on soft-mounting the little O.S. 26 on a Clancy Lazy Bee. Clancy describes using fuel tubing above and below the mounting screws. Not a very good setup, in my opinion.

What are your thoughts on a better idea?

LYNN DODSON
via email

Thanks for the support; I appreciate it. Soft mounts certainly do have their place within the broad spectrum of our hobby. On .25 to .90-size glow engines (2- and 4-stroke), however, the soft mount is not the answer, in my opinion. I'm still a believer in rigid mounts—the more rigid the better—in combination with carefully balanced props and spinners. Hard maple mounts extending through the firewall and passing through former 2 and possibly former 3 are an excellent rigid setup. Aluminum beam mounts are also a good choice. I prefer them over radial aluminum mounts because the two separate beams that are bolted to the firewall spread out over a larger area than do the radial types, thereby reinforcing and stiffening the firewall.

Good luck, and balance that prop.

CC

APPRECIATES OUR HONESTY!

I read your article concerning oil content in fuels. Thank you for being frank with your readers about this, as it has caused us great cost through the years.

RJL has always recommended at least 18 percent oil with our RJL, HP and Mecoa engines. When you drop below this amount, you walk a fine line between survival and absolute disaster for your engine.

Usually less oil content will provide a slight power increase, as you have more burnable fuel, but along with that, you run the risk of higher temperatures and the initiation of wear. Once wear starts from lack of oil, it can't be reversed.

These are some of the problems we have encountered from low oil content:

- Piston rings getting stuck in the groove from the aluminum piston material scuffing into the ring area. This usually happens when the break-in period is rushed with a low oil content fuel.
- Wristpin areas in piston wearing prematurely.
- Bearings wearing much faster than normal. Remember, 14,000rpm is severe duty for ball bearings.

Also a note:
Really hard chrome holds up better than nickel in cylinders, but both work fine with the right oil content.

The other big problem is RUST. Some oils do not have the protective properties of good old castor. We recommend fuel with some castor.

I've seen engines as old as only a few weeks coming back with rust on bearings, cranks, wristpins and every other steel part. Naturally, it's our fault, right?

The alcohol in glow fuel attracts moisture from the air. If you don't run your engine dry and use an after-run oil, you'll get rust; or you could just use an all-castor fuel like the good old days and put up with the mess all over your airplane.

Anyway, thanks for writing the article and hopefully getting some fuel manufacturers in gear with some really useful information on their product—rather than just nitro content.

RANDY LINSALATO
RJL Industries

OIL CONTENT IN FUELS

Several people have called or sent me copies of Chris Chianelli's article in the October issue entitled, "Oil Content—The Right to Know." Mr. Chianelli has made so many outrageous, inaccurate, untrue and offensive statements, it's hard to know where to begin. How about with, "Don't let any self-appointed 'expert' talk you into second-guessing the designers of these engines." It would appear that Mr. Chianelli has ordained himself the "self-appointed expert," and without any professional credentials on the subject whatever that I am aware of.

There are a number of very good reasons for a fuel manufacturer to not list the oil contents of the fuels on the labels, the most important being that *the amount of oil required for a model engine fuel to function properly is entirely dependent upon what kinds of oils are being used.* As with food, all oils are not the same and darned sure aren't equal.

Mr. Chianelli glaringly exposes his own ignorance on the subject by either ignoring this fact, or being totally unaware of it. As an example, one popular brand of engine now includes wording in their instruction sheet to the effect that they no longer recommend oil contents *because of the great differences* in the different types of oils. Except in the rather unlikely event the user had extensive knowledge and expertise on the subject of lubricants, a percentage number printed on the jug would not only be meaningless and useless, but most likely quite misleading.

Knowing that they have no control of what kinds of oils are going to be used in their engines, most manufacturers simply try their best to protect themselves by stating a percentage high enough to cover as many potentials as possible. Let Mr. Chianelli invest years of his time and hundreds of thousands of dollars of his money in a fuel manufacturing business, and then see how willing he is to "tell all" about ingredients.

While touting an inexperienced beginner (and very small entity) in the fuel business, he has incorrectly, unfairly and, by tone, maliciously, given a black eye to a number of fuel manufacturers who have produced high-quality products for many years. He owes the fuel manufacturers and *Model Airplane News* readers a public apology... in print. Let's see if he has the integrity to do so.

DON NIX
Powermaster Fuels

I agree when you say "... most manufacturers simply try their best to protect themselves by stating a percentage high enough to cover as many potentials as possible." And in protecting themselves, engine producers, in turn, protect us modelers who have spent hard-earned cash on expensive engines. That is my first concern. CC

AIRWAVES

QUIET SUPER TIGRES

I also played with a small steam engine in the late 1930s. My unit was candle-powered.

I have a SuperTigre 3000 with low run time, and I would like to convert it from glow to ignition. I have a few questions:

1) What ignition system is available for the 3000?

2) Do I need special tools to install it?

3) Is there a muffler for the 3000 that will keep the noise level down to 95dB? We have a strict muffler rule!

NORMAN FRANZINO
Royal Palm Beach, FL

Cabral Systems Inc. and C.H. Electronics both make electronic ignition systems for the SuperTigre 3000 that require no machining or complicated wiring for installation. And both companies offer extensive consumer assistance: contact Cabral at (800) 646-5745 and CH via fax at (307) 857-6900.

In my opinion, the best muffler for the task is a Q-2K from Davis Systems. It does a fine job of quieting things down without being overly restrictive. Because of the internal complexity, the Davis unit does cost more than a standard expansion-type muffler. If, however, your S.T. 3000 will see a lot of use, a few extra dollars are well worth it.

You did not say whether you intend to run the engine on methanol or gasoline. I strongly recommend methanol because of its power and cooling advantages over gasoline. Remember also that timed ignition precludes the need for expensive nitromethane. By having control over the ignition timing, you can virtually eliminate pre-ignition—a heat-producing enemy. Consequently, you'll be able to run larger props without driving the engine into detonation—as can be the case with glow-plug ignition. The combination of the larger, slower-turning prop (18x10 optimum on the 3000) and the Davis muffler should make dB levels in the low 90s obtainable with no problem. That should make club officials smile!

CC

ERRATA

The phone number for Critter Bits & Multiplex USA has been misprinted in several of their ads. The correct phone number is (818) 568-4757.

Pilot PROJECTS

A LOOK AT WHAT OUR READERS ARE DOING

SEND IN YOUR SNAPSHOTS

Model Airplane News is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable. We receive so many photographs that we are unable to return them.

All photos used in this section will be eligible for a grand prize of $500, to be awarded at the end of 1998. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in!

Send those pictures to: Pilot Projects, Model Airplane News, 100 East Ridge, Ridgefield, CT 06877-4606.

FLYING DUTCHMAN

A construction article by Roy Day in the February 1995 issue of *Model Airplane News* was all the motivation Rob Peereboom Voller of The Netherlands needed to build this Mk VIII Spitfire. His modifications included: a Saito .90 FS, which was mounted upside-down inside a hand-made fiberglass cowl; the Saito's muffler was mounted toward the back of the cowl and then connected to the six exhaust stacks on the right side of the fuselage; the breather nipple was connected to the stacks on the left side, and the whole engine assembly was mounted as one block to an aluminum backplate via soft mounts. Rob says it weighs about 7 pounds and flies wonderfully.

STOL

This scratch-built, half-size model of Dee Millett's Desert Duster was built by Sam Girardi of Manhattan Beach, CA, and takes off using only two feet of runway. Better yet, its landing rollout distance is only one-half turn of the wheels. A Magnum .60 pulls the 12-foot-span, 9-pound plane along at a ripping 8mph. Sam uses a Futaba 4NBF radio that drives two S-148 servos for the tail surfaces (full-flying horizontal stabilizer) and one S-3002 for throttle.

CARIBBEAN AEROBAT

From the Dominican Republic, George Taule sent us a picture of his Wigens Z-250 by Cactus Aviation. This big plane weighs 23 pounds dry, is powered by a 3W-70B Modellmotoren, uses an FP T8UAP PCM 1024 radio with Hitec servos and has a wingspan of 99 inches. Its smoke system is by B&B, and the fuel and smoke oil tanks each weigh 32 ounces. George said it's a great flyer and, for the first flight, the trims didn't even have to be touched.

SPARROWHAWK

Michael Allen of Endicott, NY, built this Miles Sparrowhawk (1935) model, which was designed by Dick Allen. It has an 88-inch wingspan, weighs 20 pounds, is powered by a G-62 and is covered with Monokote and Hobby Poxy paint. Mike says it has unlimited vertical performance, is very aerobatic and extremely easy to land. Sounds like a winner.

FLORIDA WARBIRD

Rich Uravitch sent in a photo of Lenny Stanko's P-40, which was built from Ziroli plans. Lenny hails from Ovieda, FL, and powers his Warhawk with a Sachs 4.2 engine. The plane has a fiberglass fuselage and cowl and Robart retracts, weighs 27 pounds and is guided by a Futaba 7UAF. Rich has flown it and says it moves along rather briskly.

"BIG Y"

This Ikon N'West is the 92-inch wingspan Model Y Gee Bee built by George Moberg of Bonita, CA. It weighs 20 pounds, is powered by a Quadra 52, has Simple Smoke (TME) and is covered with Super Coverite and painted with Krylon paints. It took one year to complete.

SAY CHEESE!

Dan Baumann of Switzerland sent in a picture of his beautiful Monocoupe D-145 by Ikon N'West. The plane has a 96-inch wingspan, weighs 18 pounds and is powered by a 3W 35cc gasoline engine. À la Charles Lindbergh's 1934 version, Dan added some unique modifications: fuel tanks, flaps and wing-strut fairings. The plane is covered with 21st Century fabric and has custom-made decals. He says it flies beautifully and will do most aerobatic maneuvers. He doesn't, however, do any negative maneuvers.

FIRST SCALE PROJECT

Nineteen-year-old Embry-Riddle student Chris Wolfe (his dad is Larry Wolfe of Jet Hangar Hobbies) took on a Royal Products Zero Senior kit as his first scale project. Besides a fully detailed, scratch-built cockpit, the A6M5-52c Zero has a sliding canopy, a fully enclosed, functioning exhaust system, scratch-built guns, flaps, retractable scale landing gear and tailwheel and functioning fiberglass gear doors. The model is powered by a SuperTigre .90 spinning a 3-blade 14x7 Graupner propeller and uses an Airtronics Spectra 7 for guidance. Nice job, Chris; we guess it runs in the family.

LONG ISLAND LUFTWAFFE

This Fw 190 D-9 was scratch-built from an old set of Dave Platt plans by Jeffrey Pogar of E. Patchogue, Long Island, NY. He modified the airfoil to a Clark-Y, added split flaps and increased the wingspan to 65 inches. It took him 10 years to complete the 10-pound model. It has a SuperTigre .90 with a homemade 14x6 propeller, a 6-channel Futaba Skysport radio, Robart retracts and Nelson paints and decals. Jeffrey says it flies like it's on a wire and performs very crisp maneuvers.

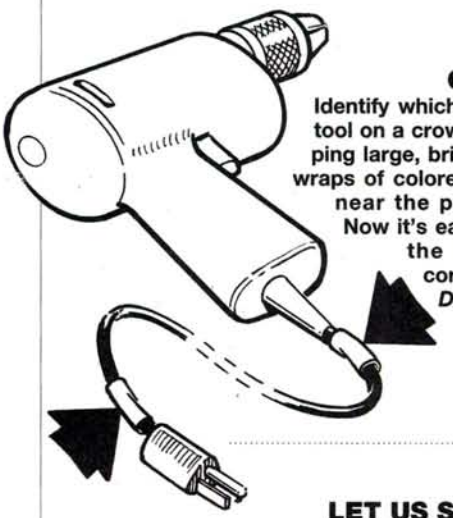
PASSING ALONG THE TRADITION

Jim Luby of Mesa, AZ, sent a photo of his sons, Tony and Michael (ages 10 and 11), who now comprise the third generation of R/C flyers in the family. Tony holds his Great Planes Ultimate Biplane, powered by a SuperTigre .45, while Michael holds his Ace R/C Staudacher 300, also powered by an ST .45. Jim claims that identical engines help to keep the competition even. Jim, along with his father, Silvio, started flying 24 years ago, and they seem to have passed along the tradition. R/C flying is a good family activity.

Hints & KINKS

by JIM NEWMAN

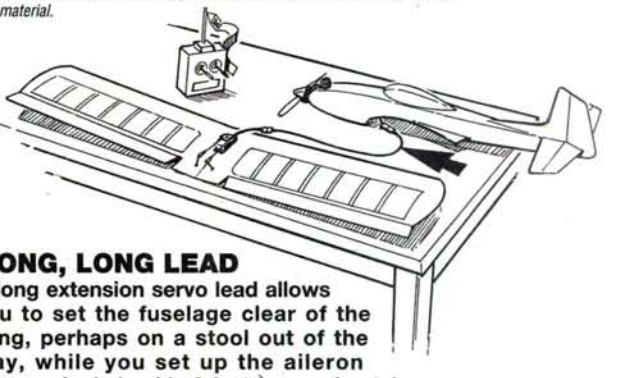
Model Airplane News will give a free one-year subscription (or one-year renewal, if you already subscribe) for each idea used in "Hints & Kinks." Send a rough sketch to Jim Newman c/o Model Airplane News, 100 East Ridge, Ridgefield, CT 06877-4606. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we can't acknowledge each one, nor can we return unused material.



CORD I.D.

Identify which cord belongs to which tool on a crowded workbench by slipping large, brightly colored sleeves or wraps of colored tape around the cord near the plug and near the tool. Now it's easy to match the plug to the tool in the tangle of cords.

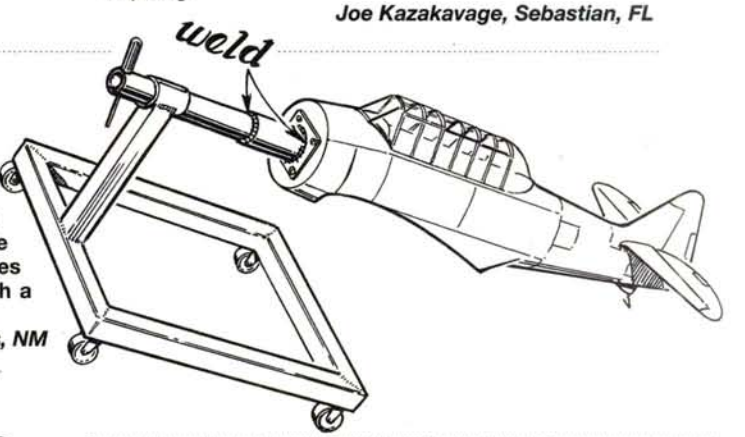
Dil Brandow, Riverside, CA



LONG, LONG LEAD

A long extension servo lead allows you to set the fuselage clear of the wing, perhaps on a stool out of the way, while you set up the aileron throws. Joe's lead is 3 feet (approximately 1m) long.

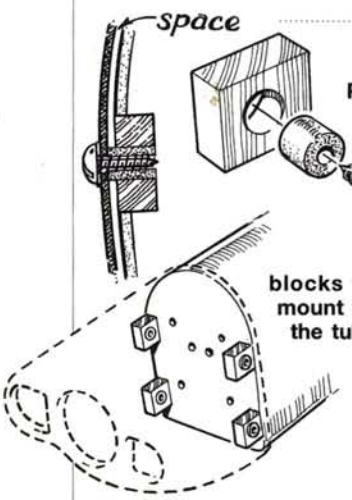
Joe Kazakavage, Sebastian, FL



LET US SPRAY

Ross turned his roll-around car engine stand into a fine spray-painting jig. He used muffler pipes that were 2.5 and 2.25 inches (63 and 57mm) in diameter, both welded to a flat plate, as shown. The plate is bolted to the model's firewall. The pipes rotate in the stand and can be turned with a screwdriver.

Ross Meyer, Los Alamos, NM



VIBE KILLERS

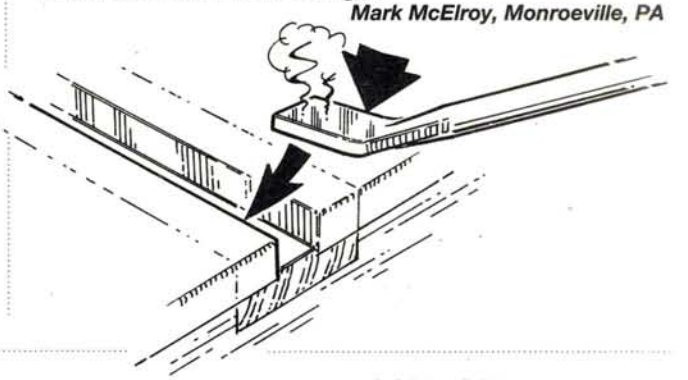
Prevent vibration-induced cracks in plastic cowls by using CA to glue short lengths of rubber fuel tubing through wooden blocks, allowing the pieces of fuel tubing to protrude about 1/32 inch (0.8mm). Glue the blocks to the firewall as shown, then mount the cowl with short screws into the tubing. This isolates the cowl from the vibrating airframe.

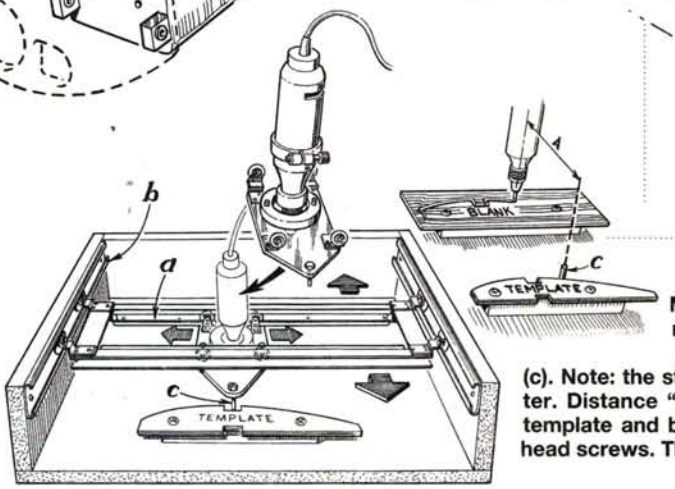
Rick Brown, Furlong, PA

HOT TOPIC

To seal covering film down to the sides and bottom of landing-gear slots, just heat up an old screwdriver on the sole of your covering iron and use it to seal the film. It helps if you bend the blade slightly, as shown. Why not make an assortment of tools of flat steel? The thicker the steel, the better; it will hold the heat longer.

Mark McElroy, Monroeville, PA

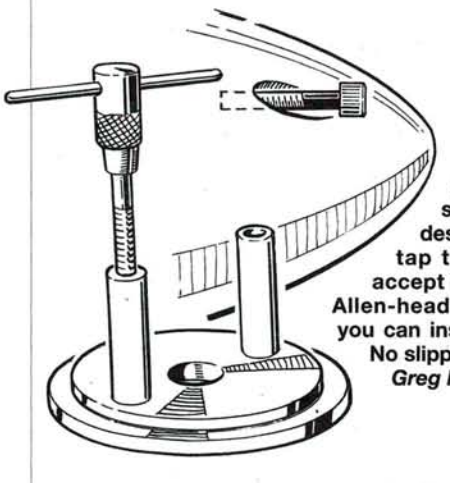




COPY CAT

Make this simple copy router by screwing two sets of drawer rollers (a) and (b) inside an open-sided box. The router is mounted on a Plexiglass or Lexan platform with the stylus (c). Note: the stylus must be turned to the same diameter as the router cutter. Distance "A" governs the size of the biggest part you can copy. The template and blank are each raised on a block and are secured with pan-head screws. This is a very accurate way of reproducing identical ribs.

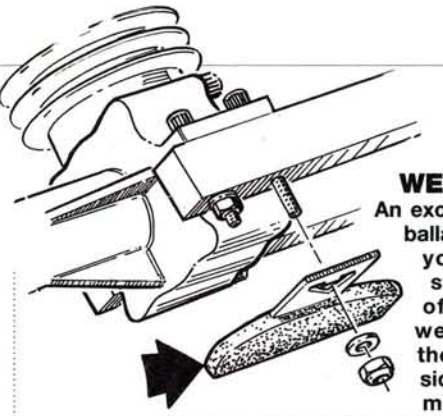
Clarence Huddle, Citrus Heights, CA



TAP DANCE

Instead of using the sheet-metal screws that are supplied with plastic spinners (the slots of which are quickly destroyed by screwdrivers), tap the backplate posts to accept the appropriate size of Allen-head capscrews into which you can insert a regular Allen key. No slipping, no chewed-up slots!

Greg McFadden, Richland, WA



WEIGHT LIFTER

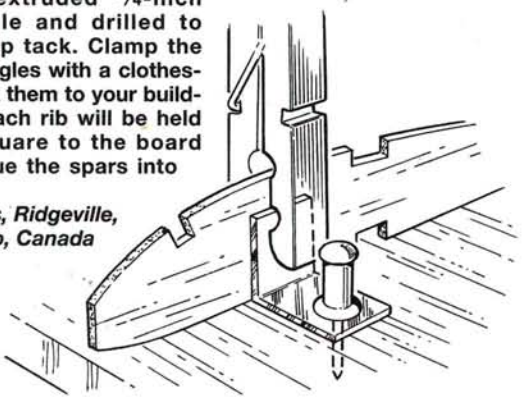
An excellent way to add ballast to the front of your model is to straighten the tab of your old tire weights, then bolt them to the underside of your engine mount. This puts the weight well forward, where it's needed, and where it can be clipped away with shears to adjust the balance point of the model. Do not bolt ballast to the cowls. More often than not, the little cowl mounting screws will be torn out by the vibration. Your friendly tire man will probably give you some old weights.

Bruce Burns, Thunder Bay, Ontario, Canada

RIB THINGAMAJIG

These little aluminum angles have been cut off a length of extruded 3/4-inch (20mm) angle and drilled to accept a map tack. Clamp the ribs to the angles with a clothespin, then tack them to your building board. Each rib will be held perfectly square to the board while you glue the spars into their slots.

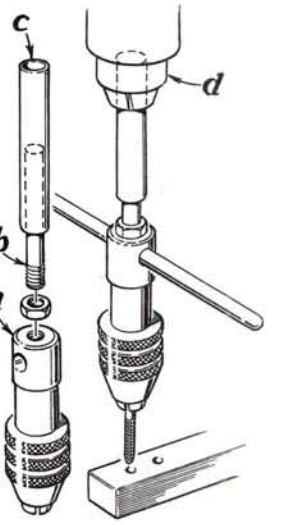
Jack Dundas, Ridgeville, Ontario, Canada



TAPPING WITHOUT TEARS

Keep your tap held perfectly vertical by using your drill press (which must be disconnected from the electrical power!). Drill the top of a Craftsman no. 4067 chuck (a) with a no. 3 drill, then tap a 1/4-28 hole. Screw in a headless bolt (b), then lock it into place with the nut. Slip the bushing (c) over the bolt, then lock it into the drill press chuck (d). Use the T-bar to turn the tap to cut absolutely vertical threads.

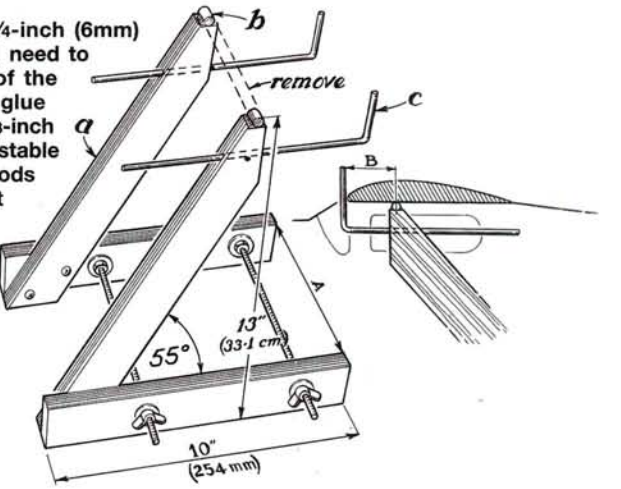
Jay Wallace, Ashland, OR

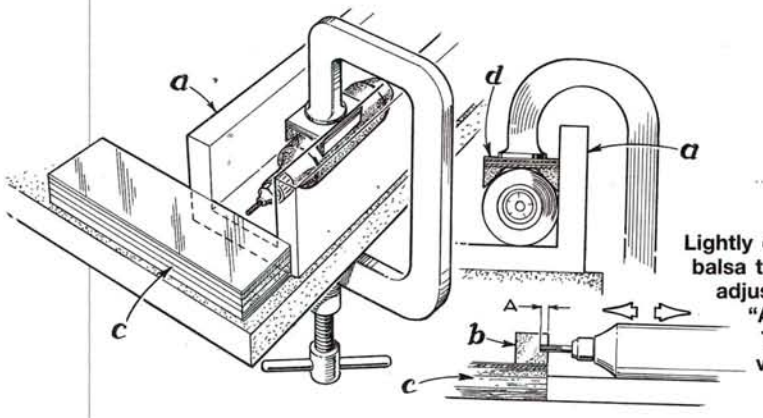


BALANCING ACT

Make this balancing jig out of lumber you have around. The 1/4-inch (6mm) threaded rod, washers and wing nuts are probably all that you'll need to buy! Part (a) is 1 1/4x3/4x15 inches (32x20x381mm); the base is of the same material. Glue and screw the parts together before you glue short 1/4-inch (6mm) dowel rollers (b) to the top. The rods (c) are 1/8-inch (3mm) wire and are a firm fit in the diagonals. Distance "A" is adjustable and "B" is the distance from the leading edge to the CG—the rods automatically align the wing correctly on the dowels. You might need to enlarge the jig for big models. To ensure alignment, glue one long dowel to the top, then cut out the center.

Roy Sedrel, Crossville, TN





ROUTER SLOTTING

Lightly clamp your moto tool into the corner of a miter box (a). The balsa trailing edge (b) sits on slick parcel-tape-covered shims (c) to adjust the height of the balsa ready for routing. The depth of slot "A" is set by adjusting the position of the tool back or forward. The 1/4-inch (6mm) plywood and balsa device (d) is used to prevent crushing the moto tool case.

Bruce Dealhoy, Aurora, Ontario, Canada

MODEL AIRPLANE NEWS

FIELD & BENCH REVIEW

Poetry in

Global Hobby Distributors

Raven ARF

THIS IS ONE RAVEN Edgar Allen Poe would especially have liked to have around. Poe's raven said, "Nevermore."

by CRAIG TRACHTEN

Global's* Raven ARF says, "Let's go fly." That's exactly what you will want to do with it, every chance you get. Global's Raven ARF is a well-built, good-looking aircraft that comes with excellent documentation. Although a beginner would not have any problem successfully building this ARF, the Raven should not be flown by a beginner.

CONSTRUCTION

• **Wing.** First, open the servo-mounting area in each wing half. Then trial-fit the servo rails into place. The installation can be a little tricky, so take your time. When you're satisfied with the fit, apply epoxy (or CA gel) and complete the installation. Before installing the servos, cut aileron extension exit holes near the root of the wing. Follow the suggestions in the instruction manual for snaking the extension through the wing and then secure the servos in the wing. The wing joiner and wing halves are joined the same as most ARFs. The ailerons are also installed as in other ARFs, except the Raven has inboard and outboard aileron tips and wing-tip plates. Just follow the instructions for their application. Attach the control horns and linkages, and the wing is ready to be mounted to the fuselage. The front mounting holes

PHOTOS BY WALTER SIDAS & GERRY YARBISH

are factory-drilled and countersunk. Place the wing on the fuselage and insert the wing bolts; press down on the wing to make an impression in the front mounting blocks. This is where you will drill holes for the blind nuts. Insert the blind nuts and secure the wing to the fuselage using the front mounting bolts. Locate the rear mounting plate and measure and drill it as indicated in the instructions. When you are happy with the fit, CA the blind nuts into place. Your wing is now secured to the fuselage.

motion

• **Tail surfaces.** Mark the centerline of the horizontal stabilizer and remove the covering where the stabilizer attaches to the fuselage. After checking to ensure that it's aligned properly, epoxy it in place. Next, attach the elevator to the horizontal stabilizer. My kit had a single-piece elevator. Todd Nicholson, Global's product representative, told me that the new kits will have a split elevator with a Y pushrod. This will prevent the occurrence of elevator differential (when elevators halves have two different deflection angles) that's caused by the force of air pressure on the side of the elevator that doesn't have the control horn and rod to support it. Now both sides will be supported with a control horn and pushrod.

Now trial-fit the vertical stabilizer and mark where the fuselage aft fairing touches the fin. Remove the covering just below your marks, test-fit again, then epoxy into place. Before you attach the rudder, the tailwheel assembly must be installed. The tailwheel control arm has to be inserted into the rudder. Mark and drill the hole for the tailwheel control arm, then test-fit the rudder to the vertical stab, making sure the hinge slots and the tailwheel control arm hole all line up. When you are satisfied with the fit, epoxy the rudder into place.

• **Main gear installation.** The main landing-gear wires are prebent and fit into precut slots in the landing-gear block. They are held in place with four straps. Next, trial-fit the landing-gear cover plate. Some material will have to be removed to allow for the landing-gear straps. Do not completely glue in the gear cover plate; it might have to be removed for repair or adjustment. I held mine in place with one drop of CA in each of the four corners.

SPECIFICATIONS

Manufacturer: Global Hobby Dist.

Model name: Raven ARF

Model type: aerobatic

Length: 42 in.

Wingspan: 52 in.

Wing area: 362 sq. in. (2.514 sq. ft.)

Weight: 6 lb. (96 oz.)

Wing loading: 38.19 oz./sq. ft.

Engine required: .40-.53 2-stroke

Engine used: Magnum .46A

Props: APC 11x6 or 10x8
[My Raven liked the 10x8.]

Muffler: stock

Channels req'd: 4, with 5 servos

Radio used: Futaba 8UAF

Fuel: Morgan Omega

Price: $275

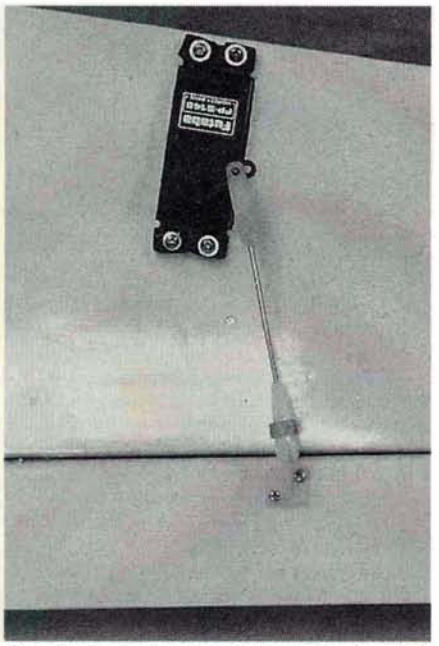
Features: Ultracote covering, factory-painted fiberglass cowl, complete hardware kit, custom wheel pants and spinner, and authentic Raven decals.

Comments: this is a really nice sport aerobatic airplane for those who appreciate high-speed performance.

Hits
- Excellent construction.
- Very good documentation and construction photos.
- Complete hardware kit included.
- Factory-painted fiberglass cowl.

Misses
- Raven decal and paint on cowl not completely fuelproof.

I fly off a grass field, and the wheels supplied are too small to use there successfully (unless the grass is cut short). I replaced them with Du-Bro's* 3-inch Lite wheels. The wheel pants had to be opened to accommodate the larger wheels. My initial installation used the supplied wheels; I then disassembled and modified it for the larger wheels. To finish the landing gear, cover the struts with the pre-finished strut covers.



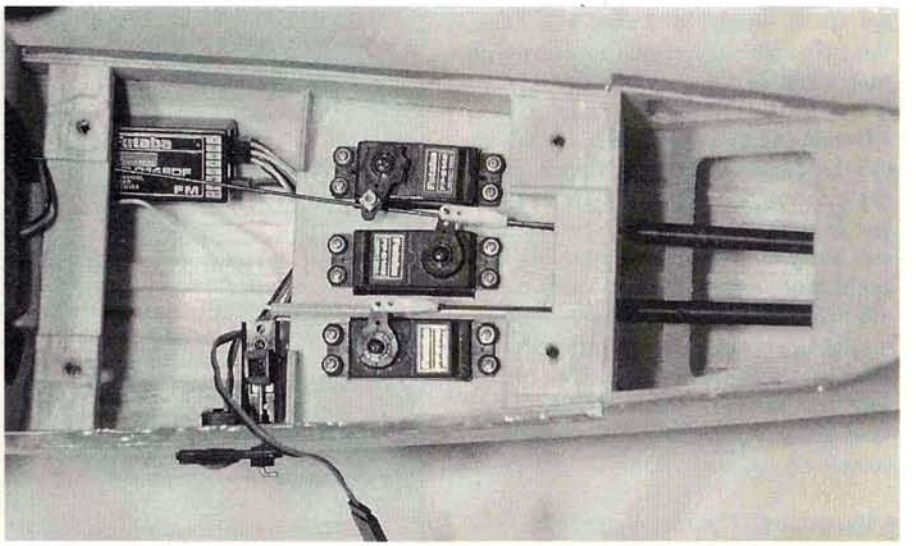
The aileron servo, control linkage and control horn setup for the left wing panel.

• **Radio and control horn installation.** Attach the servo tray and secure the servos as pictured. The receiver was mounted just in front of the servo tray, and the receiver battery was mounted in the rear of the compartment behind the servo tray, up against the bulkhead. Measure and mark the holes for the screws of the control horns and then install them.

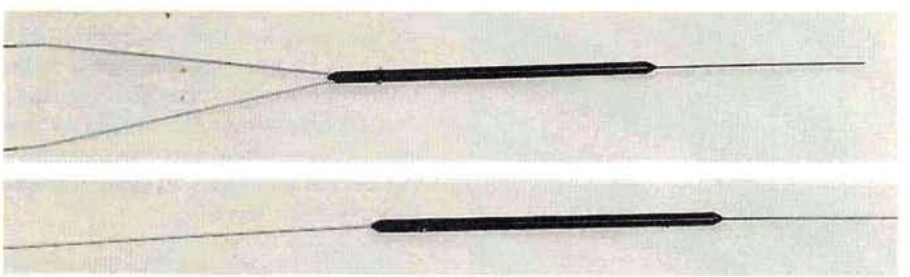
• **Pushrod construction and installation.** All materials are supplied to construct the pushrods. Since I had one of the older kits with the single-elevator pushrod, I used Dave Brown's* fiberglass pushrods. His pushrod kit comes with the proper fittings to construct a split pushrod. If your kit comes with the materials to construct the split pushrod, follow the supplied instructions. They are easy to make and will work fine.

The pushrod exit holes have to be measured, marked and cut out. It is my opinion that this should have been part of the fuselage die-cut process. When installing the split elevator pushrod, insert pushrod guides into the rear fuselage and push them toward the servo tray. Then insert each end of the pushrod into the guide ends and pull the guides back toward the tail. The pushrods will now exit the tail end of the aircraft with no problem. This works well with single-pushrod installation, too. Because of the short cabin area, the elevator and rudder pushrods must be inserted through the firewall. Do this before the engine is mounted.

If you fly from a paved runway or a putting-green type of grass strip, the supplied wheels are fine. They were, however, too small for the rougher grass strip that I use, so I substituted Dave Brown's 3-inch Lite wheels.



The radio installation is simple and very straightforward. The battery pack was mounted in the very back of the aft compartment underneath the servo pushrods.



I used the Dave Brown pushrod kit, which enabled me to make a Y connector for my elevator pushrod.

• **Engine.** The engine in the Raven is mounted horizontally. The blind nuts are pre-installed in the engine mounting box. You will have to measure and drill the engine mount for your engine. The engine should be mounted with no down thrust or right thrust. I used a Magnum* .46A on mine. I strongly suggest that you break in the engine before you install it on the aircraft. This allows for easy adjustments and prevents unnecessary stress on the fuselage. Before the engine is mounted, install the throttle pushrod on the carburetor throttle arm. Feed it through the firewall as you move the engine to its mounting position. Now bolt the engine into place.

• **Cowl installation.** Of all construction tasks, installing a cowl is the one I like the least. It's not difficult, it's just time-

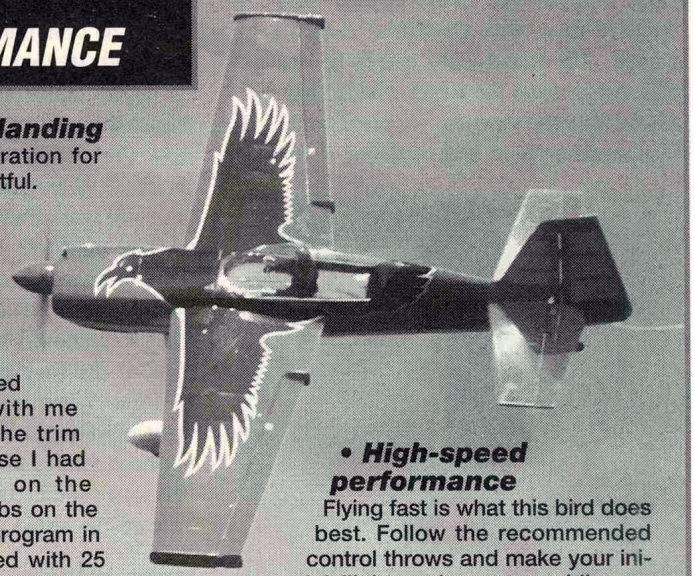
consuming and repetitive. For a clean-looking cowl, place the cowl on the nose, mark where to trim, remove the cowl, trim it and repeat the process ad infinitum until the cowl fits properly and cleanly. The muffler and needle valve have to be removed for this process. I taped over the exhaust port and used a rubber cap to cover the needle opening. This helps keep the fiberglass dust out of the engine.

• **Canopy.** To fit the crutch, the canopy has to be trimmed with either a hobby knife or Lexan scissors. It is secured to the crutch with six screws. The canopy/crutch assembly is then installed on the aircraft. The bottom rear of the crutch has to be trimmed to fit over the rear wing hold-down plate and screws. The instructions call for the canopy to be screwed onto the wing. The canopy on my kit fit snugly, so I used a piece of Velcro® under the crutch to prevent it from vibrating off.

• **Decals.** Applying the Raven decal was the last construction step. They suggest the soapy water method. This will allow you to shift the decals for proper fit and will aid you in achieving a bubble-free application. I used Windex—both methods work well. For the best-looking results, apply the decal according to the sequence in the instructions. The decals and cowl are not completely fuelproof. They suggest Black Baron Clear Coat to completely fuelproof them.

• **Balancing.** The recommended CG is 3½ inches behind the wing leading edge; this will put it on the main spar. A ¼-inch margin forward or aft is acceptable, but I would move things around to keep it on the spar. With the receiver pack mounted as far aft as possible, I had to add 1¼ ounce of lead weight to the bottom of the tailwheel bracket to keep the CG on the spar.

FLIGHT PERFORMANCE



• Takeoff and landing

Taxiing and acceleration for takeoff were uneventful. After rotation, the fun began. The Raven climbed out with no problem, but was much more responsive than I anticipated. It helped to have a friend with me who could make the trim adjustments because I had to keep my eyes on the plane and my thumbs on the sticks. If you can, program in exponential. I started with 25 percent, then cut it back to 15 percent. Landing the Raven will be no problem as long as you have room. It comes in hot and has to be flown to (*not* into) the ground.

• Low-speed performance

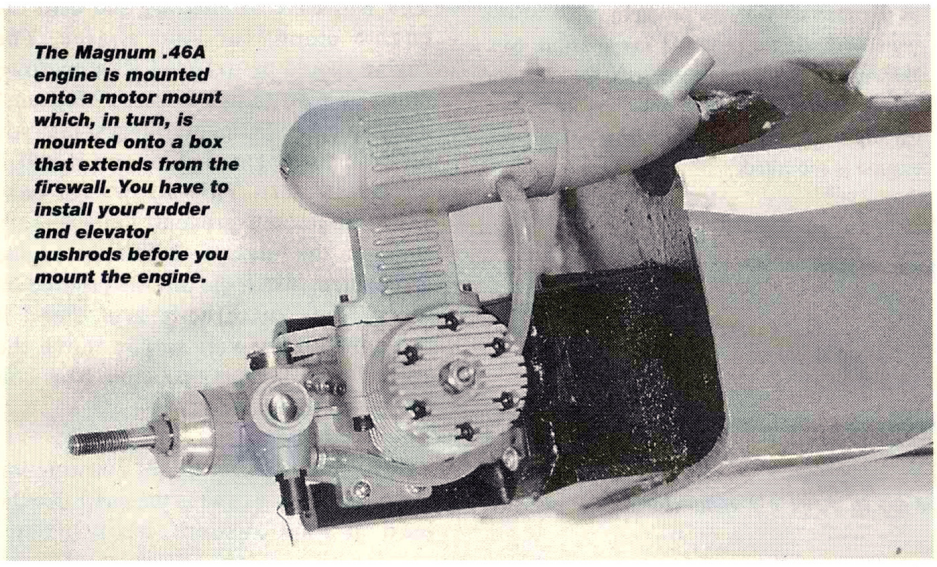
As with any aerobatic airplane, low speed is not the Raven's strong suit. It does glide, but with a rather steep angle of descent, as we experienced during a deadstick landing. Even so, we experienced no problems; just don't expect to glide a long distance back to the field unless you have a lot of altitude. During our photo shoot, we flew in near knife-edge at fairly low speeds, and as one might expect, the only problem at these low speeds was to keep the nose up. All in all, we were pretty pleased with the low-speed characteristics.

• High-speed performance

Flying fast is what this bird does best. Follow the recommended control throws and make your initial flight on low rates while you make your trim adjustments. The aircraft is extremely responsive and on high rates will turn on a dime and give you 9 cents change. The Raven tracks extremely well at high speeds.

• Aerobatics

It will do whatever you want it to do, and it will do it fast. Inverted flight can be held with little effort. Rolls to the right were crisp and axial. Rolls to the left were not quite as responsive but were improved by programming in some differential. Knife-edge flight could be held, but it starts to lose some altitude when a turn is initiated. Avalanches were the most fun. I would almost bet that the prop could cut its own tail. The Raven tumbles so fast and tightly that I almost had a few of the guys at the field convinced that it could cut its tail.



The Magnum .46A engine is mounted onto a motor mount which, in turn, is mounted onto a box that extends from the firewall. You have to install your rudder and elevator pushrods before you mount the engine.

• **Flight controls.** Follow the recommendations for high and low rates. The Raven is so responsive to control inputs that it could be disastrous to exceed the recommendations. I like to breathe when I fly, so I even programmed in a little exponential to tame this bird.

FINAL THOUGHTS

If you are weak of heart or suffer from slow thumbs, stay away from the Raven. If you are the type of flyer who appreciates a well-built kit that flies more like a rocket with control surfaces than your grandpa's Cub, Global's Raven ARF is right up your alley. Despite a few minor shortcomings, this aircraft will give you many hours of high-speed fun. Enjoy!

**Addresses are listed alphabetically in the Index of Manufacturers on page 158.*

The best in the U.S.

AMA Scale Nationals

by JIM RYAN

Harold Hester's Spacewalker lifts off for a flight in the third round of Designer Scale. As a home-built with fabric covering and generous wing area, the Spacewalker is a great candidate for a scale model.

WHILE other events may be more glamorous, only one contest determines the U.S. National Scale Champion: the granddaddy of them all, the AMA Scale Nats. The '97 edition was held at the national flying site in Muncie, IN, from July 11 to 13. The weather was nearly perfect, and 35 pilots competed in five categories: Expert, Designer, Sportsman, Fun Scale and FAI.

One nice thing about scale is that the rules have remained so balanced over the years that no particular type of aircraft has come to predominate, as is the case in events like Pattern, IMAC and C/L Carrier. This frees the builder to choose his subject without worrying about his preference dooming him to "also-ran" status. This year's well-rounded field included 15 civilian, six WW I/Golden Age, nine WW II, two military jets, and four modern military prop-driven models.

EXPERT SCALE

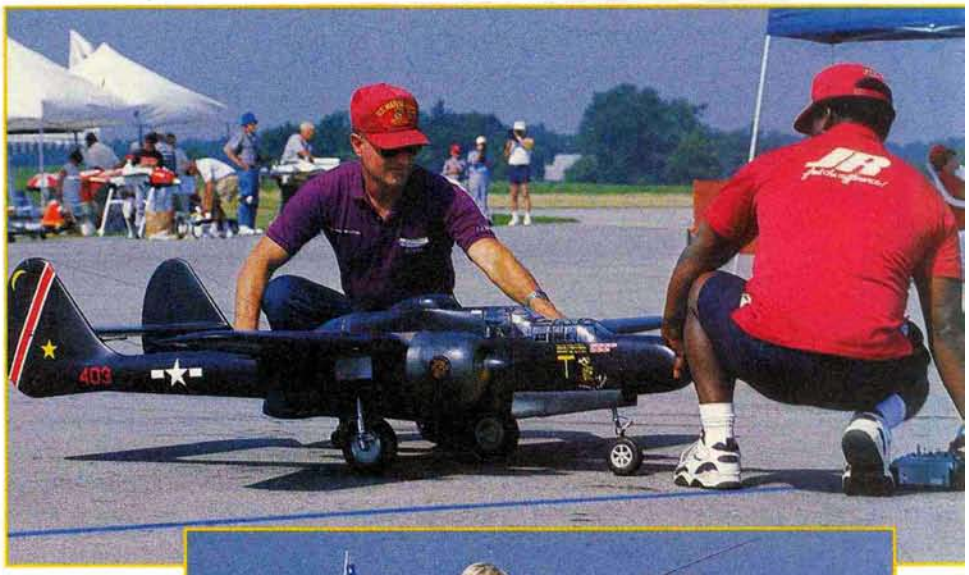
Nearly half the competitors were in Expert, and it was a real horse race, with 1.5 points separating the top five. Greg Hahn, flying his magnificent B-25 built from an enlargement of Nick Ziroli* plans, recovered from a static score of 89.5 that left him in eighth place to score in the 90s in all four flying rounds. His best two flights averaged an impressive 95 to make him the 1997 national champion in Expert.

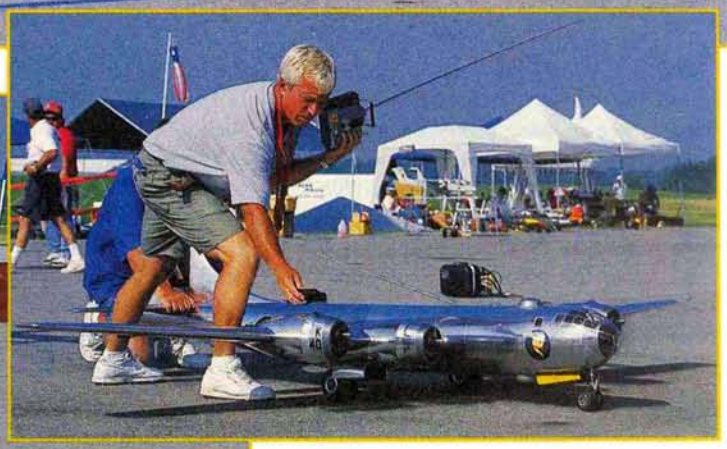
Taking second by just 1/8 point was Garland Hamilton with his Lockheed DT-33A Sea Star. Built from a BVM* kit, this beauty is powered by a JPX gas turbine—one of two true jets in attendance. Turbine

Garland Hamilton's JPX-powered DT-33A Sea Star lifts off (or lands or taxies) for another flight. The sound and performance of the turbine-powered models signals a new era for scale modeling. The BVM kit has a dry weight of 22 pounds, but it also carries a full load of 3.3 pounds of propane and oil at takeoff!

aircraft are here to stay, and they have to be seen (and heard) to be believed. The sound and performance are enough to impress even a dyed-in-the-wool WW II fan like me. With scale features like retracts, flaps, speed brakes, landing lights and wheel brakes, Garland's model is a good example of the sophistication possible with today's R/C scale models.

Terry Nitsch and his BVM F-80C Shooting Star, the other JPX-powered jet in attendance, finished third with a strong 184. Terry's model is resplendent in its chrome and red Minute Men Air National Guard color scheme (for more on this technique, see Terry's excellent "How-To" article in the February 1997 issue of *Model Airplane News*).





Top right: with assistance from Garland Hamilton, Charlie Chambers prepares his powerful Black Widow for a third-round flight. The high degree of cooperation between the competitors is great to see. Above: Mike Barbee tachs the O.S. .91 4-strokes on his magnificent 141-inch B-29 Superfortress. The operation of the four-engine giant is remarkably trouble free thanks to onboard glow, unitized powerplant assemblies. Left: Greg Hahn prepares to taxi out with his giant B-25. Scale details abound, including retracts, flaps, nav lights, bomb-bay doors and bomb drop.

Charlie Nelson's WACO VKS-7F lifts off the primary runway. Power is a Seidel 7-cylinder radial engine, and it performed beautifully en route to a first-place finish in Designer Scale.

Hal Parenti demonstrates the operation of his B-25J's sequencing retractable landing gear and operating bomb-bay doors. The scratch-built, 84-inch model is the prototype of the kit now offered by Wing Mfg.

I talked with both Garland and Terry about their experiences with the JPX. When these propane-powered units were first released, conventional wisdom held that the explosive fuel would be a problem. But in hundreds of flights, these engines have proved to be not only safe, but also remarkably trouble-free in operation. Of course, the keys are absolute attention to safety guidelines and following the operation sequence to the letter. The point is, if you're a "close enough" type of flyer who doesn't like to follow detailed procedures, turbine power is not for you.

Finishing fourth was Charlie Chambers with his sinister P-61B Black Widow night fighter. Charlie's model faithfully duplicates the spoilers in lieu of ailerons that made the full-scale Black Widow incredibly agile for such a large fighter. The attention to detail is fascinating, with touches like period magazines scattered around the radar operator's station.

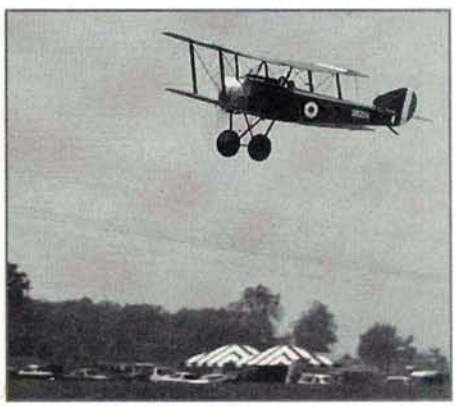
Rounding out the top five in Expert was Kim Foster with his perfectly detailed Sopwith Pup. This model shows the level of authenticity that can be attained with a WW I model. The instrument panel is exact down to the last screw, the cockpit combing is real leather, and it even has the clear inspection windows for checking the control pulleys (these WW I fighters vibrated terribly, and their fragile airframes needed constant attention). Kim made functional access hatches with dollhouse hinges—a handy tip I can't wait to try. He flies the Pup in a very scale-like fashion, taking what seems like forever to claw his way to altitude before doing a loop or split-S. Remember, with its 80hp Le Rhône rotary engine, the Pup was no powerhouse.

Terry Nitsch's F-80C Shooting Star taxies out for another flight. Built from the BVM kit, the 19-pound jet is powered by a JPX T260 and controlled by a JR PCM 10SX radio.

MULTIS ARE HERE

One in six models competing this year were multi-engine subjects, and without exception, they scored near the top of their classes. The most ambitious multi was Mike Barbee's 141-inch B-29, which was featured in "Reader's Gallery" in the October 1997 issue of *Model Airplane News*. Mike's dad flew Superforts in the war, and the attention he has lavished on this

Kim Foster prepares his Sopwith Pup for another patrol. The Pup started as an FAI Scale project and weighs a mere 15 pounds, 4 ounces. Power is a Laser 200, and the detailing is exquisite.



beautiful aircraft is truly inspiring. It's covered almost entirely with chrome Presto—a tribute to Mike's patience. Considering it's a 1/12-scale model flying against 1/4- to 1/6-scale subjects, the B-29's flight performance was remarkably scale-like; let's face it: it's hard to mimic the flight characteristics of an aircraft that spans 141 feet!

Far from being just a work of art, Mike's Superfort, which is built from Don Smith* plans, has some practical details that make it relatively easy to maintain. Each O.S. .91 Surpass engine is mounted in a unitized frame that includes the fuel system, throttle servo and onboard glow quick-disconnect, and the whole works slides right out the front of the nacelle. The bomb bay is also modular, making it easy to install the bombs. I bet the ground crews on Guam, Saipan and Tinian wish the original B-29 had been that easy to maintain!

DESIGNER SCALE

Designer Scale featured a close-fought duel between Hal Parenti and Charlie "Mr. WACO" Nelson. Charlie jumped out to an early lead on the strength of his top static score of 98 and just managed to hold off Hal in the flight rounds.

With its fabric covering and hand-molded

In a refreshing change from the ubiquitous Flying Tigers scheme, Al Kretz's P-40E sports the desert camo of a British Lend-Lease Kittyhawk. The British used P-40s extensively in North Africa.

cowl and wheel spats, Charlie's WACO VKS 7F is a tribute to the scratch-builder's art. A Seidel 7-cylinder radial engine breathes life into this 93-inch masterpiece, and that unmistakable radial snarl is absolute music.

Hal, on the other hand, campaigned the prototype of the Wing Mfg*. B-25, which he designed. With an 84-inch span and modest Enya .53s for power, this model is fairly small by current standards, and it shows that a relatively inexpensive model can compete at the very highest level if the builder is willing to put in some work (and a lot of practice!).

Hal's Cessna 336 was the sole entrant in FAI Scale, and he combined a static score of 1,571 with a cumulative flight score of

Randy Smithheisler poses with his electric PA-12 modified from a Sig 1/4-scale Cub kit. The model is powered by a geared AstroFlight Cobalt 90 on 36 cells with an AFI 204 speed control. The marine battery stays on the ground!

QUIET SCALE

While this year's Scale Nats saw gratifyingly few engine failures, the two most dependable models were also eerily quiet. Yes, the 1997 Scale Nats featured not one but two large and impressive electric models, and they offered a glimpse of what is now possible with electric power. Bob Benjamin, one of the founding fathers of scale electric flight, was back—this time, with a new immaculate 1/4-scale Taylorcraft. He was joined by his clubmate Randy Smithheisler, who flew in Sportsman with a 1/4-scale Piper PA-12 Super Cruiser that he bashed from the Sig* Cub kit. Both models were powered by geared AstroFlight* Cobalt 90 motors, and while their pilots strove for scale flight realism, both are aerobatic.

Bob's Taylorcraft is truly a beautiful model, and it scored a well-deserved 88.5 in the static judging. He said the plane really isn't finished yet, and with additional detail work, another four or five points should be attainable. With only a dozen or so flights so far, he said he's still getting used to it, but he has already managed to qualify as an alternate on the U.S team for the World Scale Championships. Bob's charming wife Teryl calls for him, and they truly are a team effort. That sort of closeness is great to see.

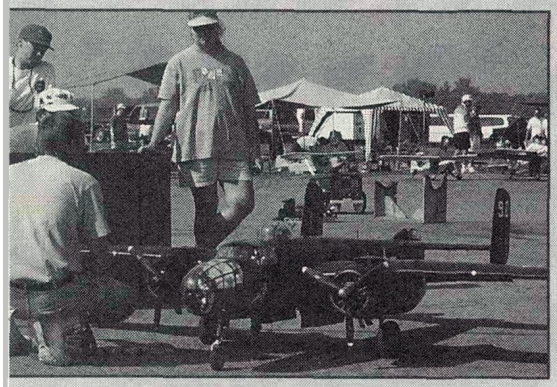
Randy's PA-12 was the subject of an article on electric conversions that he wrote for the May '97 issue of *Model Aviation*, and with Bob as pilot, it finished second in Expert Team Scale at last year's Evergreen Scale Rally. At the Nats, it scored a competitive 78.5 in static, and Randy turned in consistently solid flights.

Both Bob and Randy stressed their view that there should *not* be a separate scale class for electric models. They say this would be a tacit statement that electric models cannot compete on a level playing field when this clearly is not the case. To prove the point, Randy captured third place in Sportsman—the first trophy won by an electric model in Scale Nats competition. It won't be the last.

Bob and Teryl Benjamin pose with their outstanding electric Taylorcraft. The scratch-built model is realistically powered by a geared AstroFlight Cobalt 90 on 35 SR Max 2500mAh cells. The scale Stits covering is beautifully done. This is a brand-new model, and Bob still has some details to add.

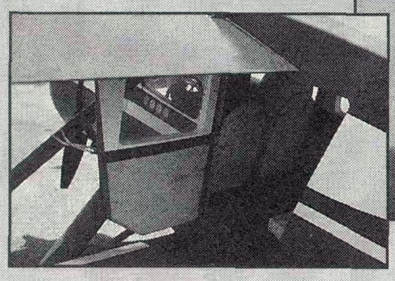
AND THE WINNERS ARE...

Neither of this year' s top finishers at Scale Nats is any stranger to the winners' circle. Expert champion Greg Hahn wowed the crowd at Top Gun when he lost an engine during one of the flight rounds. Unperturbed, he flew his last maneuvers on one engine and made an uneventful landing. This unshakable coolness under adversity has made him a consistent competitor. His B-25 is one of those models that the closer you look, the *more impressed* you become. Of conventional built-up construction, it's finished with glass cloth and paint. Scale features include flaps, retracts, wheel brakes and a functional bomb bay. The rivet detail is close to perfect, and the scale interior completes the illusion that this is a full-size aircraft.



Designer Scale champion Charlie Nelson has a seemingly endless fascination with the beautiful biplanes of the Weaver Aircraft Co. His latest rendition, a WACO VKS 7F, is scaled to match the German-made Seidel 7-cylinder radial engine. From the fasteners on the detailed cowl made with Charlie' s own molds to the rib stitching and pinking tape on the empennage, this model is a showpiece. The cabin doors open with scale latches to reveal a cockpit interior with hand-stitched upholstery and scale instrumentation. WACOs were the Learjets of their day, and the VKS includes advanced details like upper wing flaps and retractable landing lights.

Both these fine aircraft are a tribute to the patience of their builders, and their impressive flight performance shows how far scale has come in a very few years. In a very real sense, *this* is the golden age of scale R/C, in that nearly any aircraft can be successfully modeled and flown.



AMA Nationals Winners

Place	Pilot	Model	Static Score	Flight Score	Total Score
EXPERT					
1	Greg Hahn	B-25 Mitchell	89.50	95.00	184.50
2	Garland Hamilton	DT-33A Sea Star	92.50	91.88	184.38
3	Terry Nitsch	F-80C Shooting Star	92.50	91.50	184.00
4	Charlie Chambers	P-61B Black Widow	92.50	91.38	183.88
5	Kim Foster	Sopwith Pup	93.00	90.00	183.00
6	Mike Barbee	B-29 Superfortress	92.50	88.25	180.75
7	Wayne Frederick	Fokker D-VIII	94.00	86.38	180.38
8	Skip Mast	Piper J-3 Cub	88.50	86.13	174.63
9	Steve Ort	Beech Staggerwing	85.00	87.63	172.63
10	Al Kretz	P-40E Warhawk	91.50	79.88	171.38
11	Bob Benjamin	Taylorcraft	87.50	80.25	167.75
12	Gary Bussel	Spitfire	83.50	82.88	166.38
13	Bill McCallie	P-51D Mustang	85.00	81.38	166.38
14	George Jenkins	AD Skyraider	82.00	81.00	163.00
15	Ron Gagner	Morrisey Bravo	84.50	75.25	159.75
16	Bob Benson	T-34C Mentor	85.50	58.63	144.13
17	Mike Winter	Sopwith Pup	82.00	54.38	136.38
DESIGNER					
1	Charlie Nelson	WACO VKS 7F	98.00	89.63	187.63
2	Hal Parenti	B-25J Mitchell	95.00	91.00	186.00
3	Mike Gretz	Piper J-3 Cub	95.00	85.38	180.38
4	Bob Patton	T-34 Mentor	90.00	88.75	178.75
5	Hal Hester	Spacewalker	95.00	80.50	175.50
6	Claude McCullough	Rawdon T-1	96.00	75.75	171.75
FAI					
1	Hal Parenti	Cessna 336	1,571	1,058	2,629
SPORTSMAN					
1	Gary Parenti	Piper J-3 Cub	86.00	78.63	164.63
2	John Wood	Spacewalker	79.00	81.63	160.63
3	Randy Smithheisler	Piper PA-12	78.50	78.88	157.38
4	Sean Cassidy	Chipmunk	80.50	74.25	154.75
5	R. Rada	Cessna 195	83.00	66.75	149.75
6	Brian Cassidy	Super Chipmunk	66.00	75.40	141.40
7	Hank Kiel	P-51D Mustang	61.00	0.00	61.00
FUN SCALE					
1	Joe Lewis	CAP 232	5.00	85.25	90.25
2	John Dorman	OV-10 Bronco	5.00	78.25	83.25
3	Wayne Jenkins	Stampe	5.00	70.63	75.63
4	Jarold Leffel	Piper J-3 Cub	5.00	67.75	72.75
5	Dan Gaston	L-4 Grasshopper	5.00	63.25	68.25

1,058 to total 2,629 points. U.S. participation in FAI has suffered in part because the 7kg weight limit ruled out the larger scale models that are popular in this country, and few have been willing to build a model specifically for this single class. Hopefully, the new, more liberal, weight limit will help to change that.

SCALE'S FUTURE

The entry-level classes were won by Gary Parenti in Sportsman with a J-3 Cub and Joe Lewis in Fun Scale with a CAP 232. It would be nice to see more competitors in these classes, since they represent the future of scale competition in the U.S. It's not necessary to spend months or years researching and building a museum piece and then risking it in competition. Fun Scale particularly is almost entirely a flying competition, with an easily earned maximum of five static points. Even in Sportsman, it's possible to finish high with a fairly simple model if you have the right documentation and are able to fly consistently.

While it's certainly ideal to assemble the documentation first and then build a competition model, there's no reason you can't get your feet wet by gathering documentation for the warbird or civilian plane you already fly and taking it to a contest (even the Nats) next year. You'll have the chance to rub elbows with and pick up pointers from the absolute best in the business.

** Addresses are listed alphabetically in the Index of Manufacturers on page 158.*

MODEL AIRPLANE NEWS

FIELD & BENCH REVIEW

A little warbird with power to please

Ace Hobby Distributors

AT-6 Texan

by BILL THOMAS

I KNOW there are a lot of modelers like me who have dreamed of having a warbird racer. My problem is that the bulk of my income is spent on trivial things: a place to live, a car to drive, groceries, etc. When the bills finally get through with my paycheck, there often isn't much left for the "important" things like model airplanes!

The Texan being prepped for flight.

Ace Hobby Distributors* has come up with a solution for modelers on a budget and small-plane fans: their Simple Series warbirds. This one, the AT-6, is the third in the series following their P-51 Mustang and Me-109. Some modelers have chosen to modify these kits to resemble Bearcats, Sea Furys, Spitfires, P-40s and others. The Simple Series kits provide all the diversity of the larger warbirds, and the rules for ½A racing keep all the planes on a level playing field.

The AT-6 kit comes with a folded plan sheet, a set of Ace, tapered, mini, foam wings, all the necessary wood (die-cut balsa and ply, sheet balsa and various sticks), the canopy, cowl, a plastic bag containing all necessary hardware and a sheet of decals. Three supplemental pages provide the parts list, instructions for the foam wing and the Simple Series racing rules. The assembly instructions and building-sequence drawings are part of the main plan sheet.

Assembly begins with the fuselage. I noticed immediately (almost!) that the die-cut balsa fuselage sides didn't match the outline on the plans. The fuselage is supposed to be assembled "free," without

SPECIFICATIONS

Wingspan: 35 in.

Wing area: 188 sq. in.

Length: 25 in.

Weight: 19 oz.

Wing loading: 14.6 oz./sq. ft.

Engine req'd: .049

Engine used: Norvel BigMig .061 R/C

Radio req'd: 2- or 3-channel

Street price: $34.95

Features: tapered, foam wings; all necessary wood; canopy and cowl; hardware; decals; folded plan sheet and instructions.

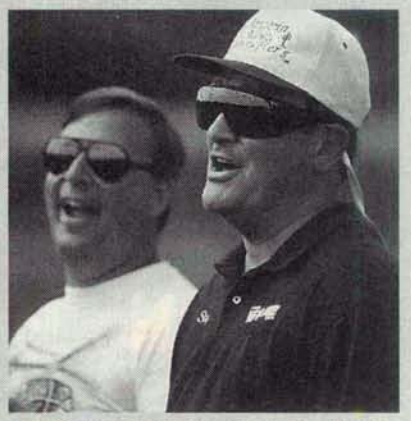
Comments: this is a quick-to-build kit that will provide someone who has moderate R/C experience with a whole lot of fun.

Hits
- Scale looks.
- Easy to build.

Misses
- Wing cutout in fuselage sides is too long.

NORTHERN VELOCITY, LTD. (NORVEL)
BIG MIG .061 R/C

With the advent of their AME and BigMig engine line, Pete and Ed Stevens of Norvel Ltd. have literally reinvented small R/C glow plane flying. They sell these engines in .049 and .061 sizes, but for the Ace Texan we used the BigMig .061 R/C engine. Unlike the small engines of the past, the Norvel engines are a joy to run, as they are much more conventional in form and function. They are Schnuerle-ported and use an AAN cylinder/piston set and a large-engine-style wristpin and conrod; and they sport a conventional carburetor, which provides good throttle control. They come with a first-class expansion muffler that offers a pressure tap to assist in maintaining fuel flow just as you find with larger glow engines. Above all else, these engines bring a reliability to the front end of small glow planes that has not been seen before.



Norvel performance, in an Ace Texan, puts a smile on your face.

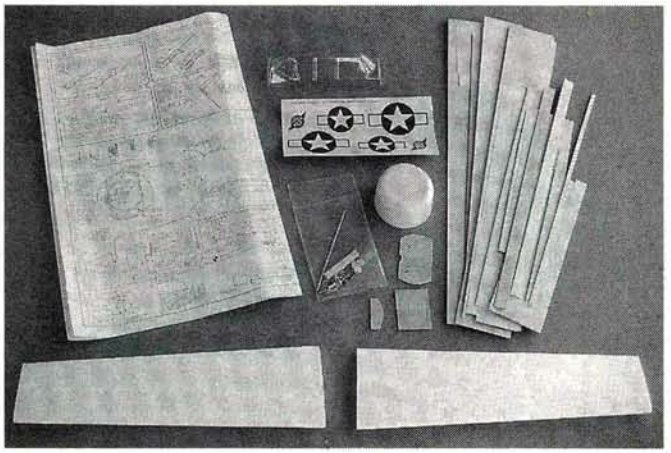
They also have a really neat website (www.norvel.com). Not only does Norvel have their entire catalogue online and secure purchasing tools so you can order on the Web, but they also provide all kinds of information on mounting tanks, breaking-in engines and selecting props. They even provide a section on tuning your Norvel engine that includes the sounds of engines running too rich, too lean and ... just right.

If you prefer, Norvel offers spring starters, tank mounts and other accessories that make it easy to replace any of the "Bee" series of engines that are produced by Cox. We chose a more conventional means of mounting and feeding our Norvel and used one of their glass-filled nylon motor mounts and a Sullivan 1-ounce tank in the Texan. In this way, installation mimics that of any glow motor and is easy to do. As with most engines, the Norvel needs a bit of breaking in, and we ran several tanks of fuel through it, keeping an eye on the needle valve to make sure it didn't go lean.

At the field, we found the Norvel engine to be a great tool to impress our buddies. First, they were not used to seeing anyone spin up a small engine with a conventional starter and have it start every time without fuss. They weren't used to seeing flight after flight run the tank to empty before the engine died. And most of all, they weren't used to seeing a small plane like this fly so quickly and do such large maneuvers. With a Cox 5x3 prop, the Texan was flying level somewhere near 5mph! It became a small item in a real rush if you didn't turn it around, which we did, doing tall humpty-bumps for effect. The Cuban-8s and loops were also large; more like those done with a .60-size plane. But what was most fun was coming low over the deck and pointing the nose skyward, doing vertical rolls before the plane even slowed down. No; the guys weren't used to that sort of performance from a small plane; neither were we. But while our larger planes sat in the pits, we were having a ball with this little plane and the Norvel powerhouse.

I guess the best testimony to the fun we had came three days later, when Rick Bell (pictured above) called to tell me that he had rushed out and bought a Norvel engine—a Texan—and was just about ready to fly it. Several of the other guys in the club have also placed orders, and we're going to do some Texan racing in Connecticut.

—Larry Marshall



Kit pieces "out of the box."

the need to pin the parts over the plan sheet, making total accuracy of the outline unnecessary. The plans show which part goes where, while the step-by-step instructions guide you through the assembly process. The fuselage is a typical box-type assembly with balsa doublers and 1/8-inch lite-ply bulkheads. The bulkheads have small tabs that line up with notches in the fuselage sides to make proper alignment easy. The firewall should be drilled for the motor mount and fuel lines before they are installed. The location of these holes varies according to motor and mount combinations, but in most cases pre-drilling will make the motor installation easier. I chose to use a Norvel* BigMig sport .061 R/C in my T-6. The muffler on this motor is directly next to the exhaust port, and I found that I needed to make a cutout in the fuselage to allow for the exhaust.[*Editor's note: the newer mufflers have a neat rotating exhaust port that eliminates the need for this modification.*] I used a round file to make a circular indentation in the fuselage side, then I glued balsa pieces to the inside of the fuselage to cover the hole. I then filed this balsa to the proper contour. This worked out well. I used aliphatic resin (white glue) for assembly, but medium and thin CA would speed up the process. Even so, I completed the fuselage and tail assembly in one evening.

The next step is the wing. I used 240-grit wet/dry sandpaper to remove the dimples left after the molding process. I did this in the kitchen sink, with water running over the wing panel to float off the little pieces of foam because they can get caught under the sandpaper and cause dings and scratches.

The 1/8x3/32-inch balsa trailing edge (TE) is glued to the wing panels, the ailerons are cut to length and the center section is prepared for the aileron linkage. The aileron linkage consists of pieces of 3/32-inch brass tube and 1/16-inch music wire that the builder must assemble and bend to fit. Those who are in a hurry may wish to substitute ready-made 1/2A aileron linkage such as that made by Du-Bro* or Goldberg/Klett*. The dihedral angle is then sanded into the center section of the wing panels, and the panels are glued together with 5-minute epoxy. Here, the plans suggest applying strips of 3/4-inch nylon strapping tape to the top and bottom of the wing. I chose to apply a strip of Hobby Lobby's* 1/4-inch (0.007-inch thick) carbon-fiber tape full span onto the wing bottom with the remnant of a 48-inch length applied to the top. I poked a 1/4-inch-wide strip of pinholes along the whole span of the wing and applied the carbon fiber with a thin coat of 5-minute epoxy. The pinholes act like "cleats" and provide more grip for the carbon fiber and help to prevent delamination. I also chose to install a balsa leading edge (LE) on the wing. Our flying field has tall, tough weeds that can leave quite a dent in a foam wing if you run into one while landing. I sanded back the LE 3/32 inch and glued on a strip of 3/32x3/8-inch balsa. Then I sanded the balsa to match the original contour of the foam wing. If you don't have a spare wing for comparison, do one at a time and use the other for reference. It's important to maintain the original shape of the LE, as it has a lot to do with the

FLIGHT PERFORMANCE

• Launch and landing

Launching is easy as the Norvel engine has plenty of power to fly the Texan after a gentle push. No running is necessary, but launching should be done with the nose pointed slightly down rather than up. Surprisingly, the Ace Texan glides well, and landings are very uneventful. After a couple of flights, we were landing very close to our feet.

• High-speed performance

With the Norvel engine, this plane is very peppy. The immediate thought is that this engine/plane combination would make for some really exciting pylon racing, and there are several of us building Texans with exactly that in mind. The plane tracks well, even in a wind at high speed.

• Low-speed performance

Slow speed? Eventually we did slow it down but it's so much fun at high speed that we only flew slowly to look at the Norvel throttle control, which was quite good. As mentioned above, however, the plane glides well and handles very well at low speed.

• Aerobatics

This is where you start wondering if you're really flying a small plane. The Norvel/Ace combo provides a very aerobatic airplane, limited only by the fact that the rudder is fixed (though we're building others with rudder control). Roll rate was very quick and, in fact, we reduced aileron throw a bit after the first few flights. The striking thing, however, is that maneuvers such as Cuban-8s can be done very large with no tendency for falling out of the top of the loops. This little Texan can eat up sky like a .40-size plane. Inverted flight was easy, and we even fashioned some 4-point rolls, though that's where we started longing for the rudder.

—Larry Marshall

Rick Bell launching the Texan.

flying qualities of the Ace foam wing.

I installed the two 1/8-inch LE wing-retaining dowels and drilled two holes in the TE for the mounting screws. Here I encountered my only problem with this kit. The wing cutouts in the fuselage sides are actually 5/16-inch longer than the actual wing assembly, and when I mounted the wing, the F-2 crosspiece was too far back to be drilled. To easily fix this, I added a piece of 1/8x5/16x2-inch lite-ply scrap directly in front of the existing crosspiece and backed the two pieces with a scrap of 1/16x5/8x2-inch plywood. This allowed the screw holes to be drilled into the new piece to mount the wing.

I drilled three mounting screw holes through the vacuum-formed plastic cowl and into the fuselage, making sure that the screw holes went through the cowl mounting blocks inside the fuselage. The racing rules state that the opening in the front of the cowl should be 2 3/4 inches in diameter. I used a hobby knife to cut a 2-inch hole, then I wrapped a piece of sandpaper around a short, cardboard tube to sand the hole to size.

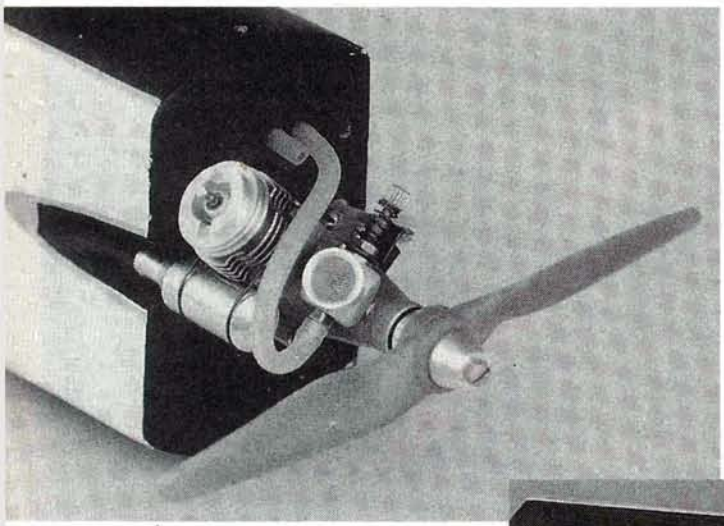
After trimming the canopy to fit, I was ready to cover the T-6 with Goldberg Ultracote, which works well at the lower temperatures necessary to cover foam wings and is very easy to use. I wanted to forego the traditional military color scheme in favor of civilian-style racing colors; hey, if you're no longer in the army, you don't really have to wear the uniform!

The plan suggests time-honored sewn hinging for the control surfaces, but I used one side of the actual covering material as a hinge. Sand the LE of the ailerons and the elevator to an angle that will allow the control surface to move, and cover the surfaces at the same time as the wing and stabilizer. This seals the hinge line and may help to prevent flutter.

Finished model before covering. Note the partial carbon-fiber spar. Bottom of wing has a carbon-fiber spar the entire length.

I painted the cowl with white Top Flite* LustreKote and the cockpit floor and antiglare forward fuselage and cowl with flat black LustreKote. The fluorescent red trim is Goldberg Ultratrim with Goldberg striping tape used for accents.

I installed the radio as shown on the plan, with the exception of the third servo that I used for a throttle. By using Tower Hobbies' THS-11 microservos, I was able to mount all three side by side. The aileron servo is in the middle, and the pushrods are inserted into the servo wheel as the wing is tipped in. I had my doubts about this when I first studied the plans, but it has worked just fine. I used a Hitec* Focus 4 transmitter with a micro-535 receiver and a 270mAh flat receiver battery pack.



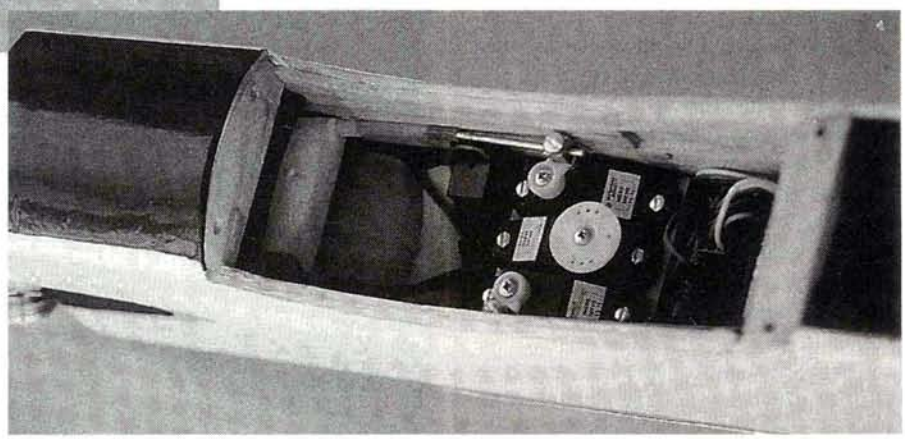
Left: engine installation showing the BigMig with the cutout for the exhaust.

Any motor mount that fits a Cox TD .049 will work. The mounting holes on the BigMig are the same as on the TD, but the top inside edges of the mount need to be sanded back a bit to fit the slightly larger crankcase of the BigMig. I used a Sullivan SS 1-ounce fuel tank and a Sullivan nylon pushrod to control the throttle.

I completed the AT-6 in three weekends of part-time effort—about 20 hours total. This model won't present a problem to someone who already has a couple of kits under his belt. To be honest, it was a refreshing change for me to build a model from start to finish in so little time.

The small-plane movement is experiencing a renewed interest. Considering the variety of micro radio systems and small motors that are available, I bet this trend will continue. The Ace Simple AT-6 should prove to be a very popular part of this segment of our hobby!

**Addresses are listed alphabetically in the Index of Manufacturers on page 158.*



Radio installation is easy because of the wide fuselage.

Danny Wampler of Scurry, TX, adjusts the .21 4-stroke on his scratch-built Supercake.

Big fun in the heart of Texas

10TH ANNUAL SMALL Ste FLY-IN

by DEBRA SHARP

Clockwise from left: Keith Tucker's Twin AR 20 is powered by two O.S. 25s and is extremely fast. Ernie Harwood's beautiful Blackburn monoplane wowed spectators. Bob Winn, Floyd Harp and Keith Tucker with two of the many "bugs" at the fly-in. David Freeling's S2F Tracker is fired up on the runway.

This Antonov AN2 semi-scale Russian biplane is the second scratch-built project of Cash Hargett of McKinney, TX. Powered by an O.S. .25, the model performed well all weekend.

ps

Howard Chevalier, known as the E-Pope, blesses planes and modelers at the start of this year's SMALL Steps Fly-In.

ON AUGUST 30TH AND 31ST, members of the Small Model Airplane Lovers League reunited deep in the heart of Texas for their 10th annual SMALL Steps Fly-In, hosted by the Dallas R/C Club and sponsored by *Model Airplane News*. This Yankee associate editor nearly wilted in the 103-degree temperatures, but I soon forgot the beads of perspiration on my brow and settled in to enjoy some easy, down-home camaraderie and conversation.

During my Texas sojourn, I realized that SMALL isn't just an organization; it's an attitude. SMALL Steppers don't come to this fly-in *just* to show off their latest models and their piloting skills; they come to sit in the shade under the shelter, drink something cold and relax and joke with old (and new) friends. Consider that this event has been held annually for 10 years, and you'll realize that these SMALL Steppers have a lot to talk about!

That's not to say there wasn't plenty of flying over the weekend, however. Looking at the paved runway, you were likely to see any number of Lazy Bees, Lady Bugs, Wasp Wings and Speedy Bees buzzing overhead. (Did I mention that there are a lot of insects in Texas?) I also counted a few sailplanes, a Russian Antonov AN2, a Spitfire, an ME262, float planes, a Stinson, a Blackburn, a Pietenpol .... Because the SMALL Steps Fly-In is open to any airplanes powered by .25ci or smaller engines, the models at this fly-in were as diverse as the lineup of country songs on my rental car's radio—and believe me, that's a little bit of everything!

A Lazy Bee has the undivided attention of these Cub Scouts.

In a time when the word "small" has disappeared from restaurant

Background: Bud Dickerson's sport float model takes off from a lake next to the Dallas R/C Club field.

PHOTOS BY DEBRA SHARP

menus, and the mantra in business seems to be "bigger is better," why are these little airplanes so popular? Besides their obviously high "cute factor," small models don't take a lot of time, money or balsa to build. Small glow and diesel engines aren't very expensive and, especially with the advent of the Norvel glow-engine lineup, have become more user-friendly. If you don't want to mess around with fuel and glow plugs, small airplanes are also perfect vehicles for electric power. In other words, if you build 'em small, you can build more of 'em in less time and with less money, *and* spend more time at the field. And don't forget, you can fit those small models into your car without sticking their wings out the passenger-side window! As a matter of fact, most of the SMALL Steppers who came to this event brought at least three of their favorite models with them.

Steve Staples of Little Rock, AR, flew this graceful Rogallo Wing.

Randy Randolph—the heart and soul of SMALL—takes a turn at the microphone.

Bob Winn ("Pop" of Pop's Hobbies in Marshall, TX) brought along his dog, Peppy, a Lady Bug and a Speedy Bee—one of the many Andy Clancy designs in attendance. No one could miss Keith Tucker of Longview, TX, who dressed up in a bright-orange flight suit all weekend and showed off his impressive piloting skills with his Twin AR 20 powered by two O.S. 25s—possibly the fastest airplane at the fly-in. The Cub Scouts (whose parents provided us with refreshments during the fly-in) trailed at his heels all weekend, begging him to do "just one more" inverted pass only inches off the runway. Keith also flew two diesel-powered models, a silver Lady Bug with a PAW .03 in its nose and a silver Lazy Bee (PAW .09). Diesel engines are a good choice for powering small airplanes: they're quiet, can spin bigger props than their glow counterparts and don't need glow-plug paraphernalia for startup.

Ernie Harwood, a British transplant now living in Arlington, TX, attracted a lot of attention with his Blackburn monoplane—a beautiful vintage airplane from 1912—that was powered by an O.S. .20 FS engine. The Blackburn was a realistic, scale flyer and gracefully puttered across the field.

Steve Staples drove all the way from Little Rock, AR, with his Wasp Wings, Peitenpol and Rogallo Wing that he built from a crashed Ace Air Scout fuselage with a handmade kite "wing." Steve also entertained the Cub Scouts with a rubber-powered balsa plane that—of course!—flew right onto the roof of the shelter and had to be "rescued" by the Scouts.

This young Cub Scout (and future SMALL Stepper?!) watches the action at the flightline.

David Freeling of The Colony, TX, showed up with a Navy "S2F Tracker"

Event CD Dannie Ball takes a break from manning the radio impound to get some stick time in.

submarine hunter—one of the many military models present. David scratch-built the Tracker from Squadron/Signal drawings and powers it with two Thunder Tiger .15 engines; the model features two dog dishes for cowls! David left Saturday evening because he had to go to work the next day, although he said that he tried to convince his employers that it was against his religion to work on Sundays (David is a Presbyterian minister!).

One of the most entertaining modelers at SMALL Steps, Howard Chevalier of Franklin, TX, brought his Astro Cobalt .15-powered, scratch-built Ercoupe, although "technical difficulties" kept it grounded for most of the event. A professor emeritus of Texas A&M's Aerospace Engineering department, he has written

This Randy Randolph sport-scale Cheetah design will be featured in an upcoming* Model Airplane News *construction article.

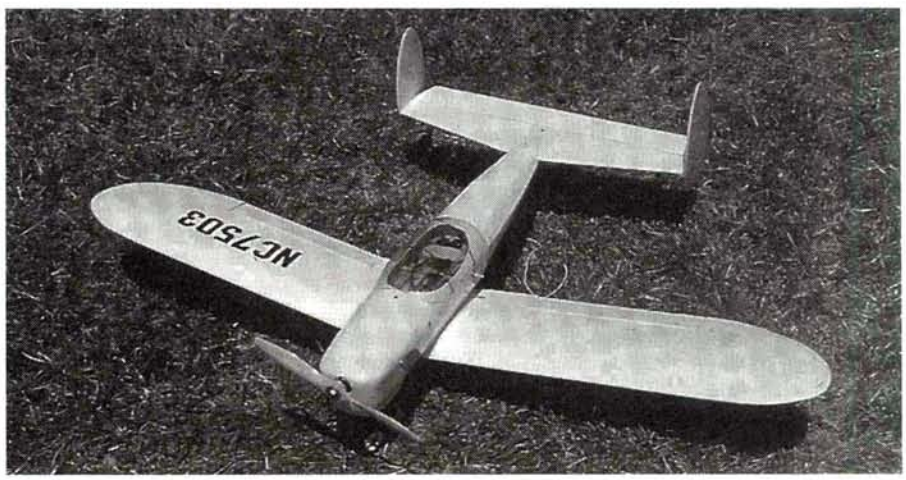
Randy Randolph (center) talks with fellow SMALL Steppers in his workshop—a modeler's haven!

been the unofficial hosts of the SMALL Steps Fly-In throughout its history; this year, Joe took his daughter to college the weekend of the fly-in and was missed by all.) On Saturday evening, Randy invited everyone back to his house in Dallas for the infamous "bull session" in his shop—a privilege extended only to SMALL members. (The top-secret SMALL initiation: simply place your right hand over your heart and say, "I promise to build and enjoy small model airplanes.")

While we talked in Randy's shop, I spied a cute little red-and-yellow model sitting on a shelf. "That's a Handful ... think you can carry it back home to Connecticut? Take it!" Talk about Southern hospitality! On the flight back East, I stretched out and chuckled, thinking about what I was bringing home to the *Model Airplane News* office: some great memories, a cardboard box with a Handful inside and, I hope, some of that good ole SMALL attitude.

"Model Airplane Design and Performance for the Modeler" and another book on propellers that's awaiting publication. Howard, known affectionately as "the E-Pope" in electrics circles, says that when he dies he will become an electrics deity—a claim supported by fellow SMALL Stepper Randy Randolph, who says yes, it must be true; Howard is indeed old enough to be God.

The quintessential lover of small airplanes, Randy Randolph showed off a Cox .09-powered Jodel Bebe, an FD-24 and his newest creation, the Cheetah—a 53-inch-span, sport-scale model of a Cierva CE .43 Guépard powered by an O.S. 15. (Randy and Joe Wagner have



Howard Chevalier's twin-tail Ercoupe is a fine example of electric scale.

POWER SLOPE SCALE

by DAVE GARWOOD

Durable warbirds for combat

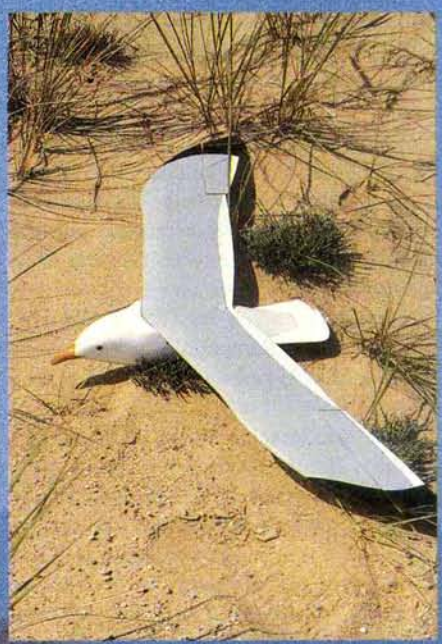
EVEN MORE AMAZING than a glider making a two-hour flight in slope lift is an unpowered bomber, warbird, or jet making the same flight. Power Slope Scale (PSS) sailplanes, a specialized branch of soaring, silently imitate the visual impact and the swift action of past, present and future powered military and civilian aircraft.

The name of the game in PSS is to create in miniature—and in silence—the look and feel of a four-engine WW II bomber, a Korean War Sabrejet, a Mach-1 experimental rocket plane and almost anything in between.

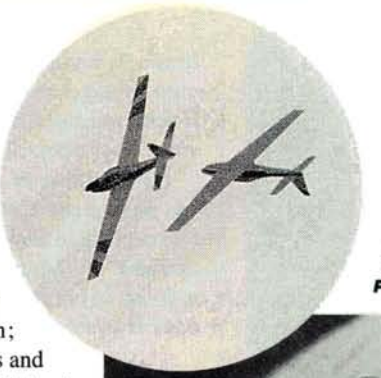
It used to be that PSS planes looked good, but weren't expected to fly well. In the 1990s, you can have both. In the old days, you could walk to the edge of the slope during a flight and say to a pilot, "Say, that's a pretty good-looking Mustang. How does it fly?"

The reply might be, "Well, you know, it's a Mustang," meaning that satisfying flight stability and agility were lacking and weren't expected. Tip-stalls were anticipated, and looking good was good enough. Planes constructed of traditional balsa might not even withstand a slope landing.

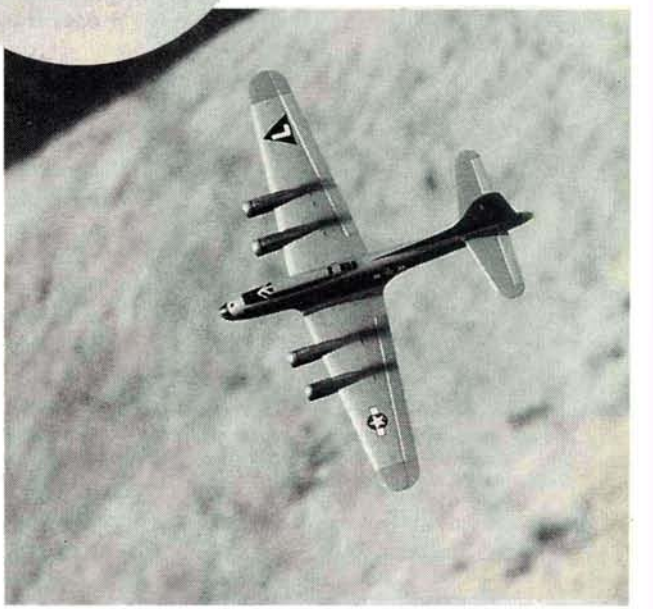
A new breed of designers and kit makers, however, now put flight performance first and visual appearance second. I'm here to tell you about two distinct types of PSS gliders with highly satisfying flight performances. You be the judge on the aesthetics.



Right: a slope soarer's hero; the PSS model of a muscle-powered prototype of the R/C Gull, a foam and fiberglass model made by The Birdworks. Background: Brian Laird's Slope Scale Me 109 over Point of the Mountain slope site during Soar Utah '95. Photos by Dave Garwood.



Left: Inland Slope Rebel pilots Brian Laird and Carl Maas show off with some tight formation flying of Super Toucanos over Cajon Summit. Photo by Joe Chovan.



Above: a Boeing B-17 designed, built and flown by Brian Laird of Moreno Valley, CA, shown here at the 1997 Los Banos Slope Scale meet. Photo by Joe Chovan.

FOAM AND FIBERGLASS PSS

In the search for a more durable plane, Brian Laird strengthened the nose of a molded fiberglass fuselage, strengthened the leading edge of the wings with spruce and made the whole package capable of withstanding cartwheel landings by permanently attaching the wing to the fuselage.

Brian's company, Slope Scale*, produces eight single-engine WW II warbirds in quick-building kits that can be highly detailed. Slope Scale will make to order heavy-fuselage layups (faster and tougher) or light layups (for lower-lift conditions). Wingspans can be determined by the builder from a scale 44 inches to a light-lift-capable 52 inches. You'll also have a chance to put an airbrush to good use with one of these kits. To Brian, it's not ready to fly unless it has panel lines.

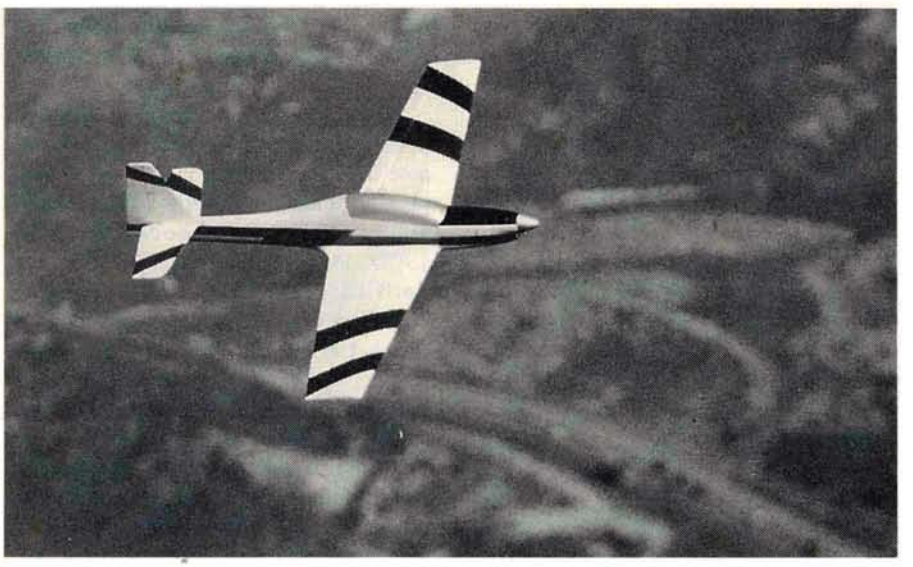
I've flown six different Slope Scale planes over the Atlantic and Pacific Oceans, the Great Lakes and the Wasatch Mountains in Utah, and I own two of them. They need some serious lift to perform at their best, but they deliver adrenaline-pumping action and performance. These planes are fast, agile, and tough—"must have" sailplanes for the experienced slope flyer and PSS aficionado.

balsa sheeting over foam-core wings.

An exquisite line of even smaller models is offered by Aero Model Design; they are made overseas and imported by Pattericks.* Warbird models available include an AT-6 Texan, an A6M Zero and a P-51 Mustang. Jets include a B-2 Stealth Bomber and an A-4 Skyhawk. These kits are heavily prefabricated, with fiberglass fuselages and presheeted balsa-over-foam wings with leading and trailing edges glued into place and sanded at the factory.

BOUNCEABLE FOAM PSS

Dave Sanders, another Southern California designer who feels a plane must fly well and then look good, designs with the tough new EPP foam. He makes planes for full contact-slope combat, but feels an airplane is not an airplane without canopy markings and a national insignia.



Embraer Aircraft (Brazil) Super Toucano designed by Carl Maas, one of several built as an Inland Slope Rebels club project, flown at Cajon Summit, CA. Photo by Joe Chovan.

For those who prefer smaller models, K&A Models Unlimited* kits include a Dago Red Racer, a P-38 Lightning, a P-40 Warhawk and a P-51 Mustang with wingspans ranging from 30 to 50 inches, all with fiberglass fuselages and

"I like crunchy music. I don't like crunchy airplanes," Dave says as he flings a bounceable EPP slope plane off a hill that not everybody would fly from, in wind that not everyone could fly in. His company, Dave's Aircraft Works,* makes four "combat scale" (not true scale) warbird kits, including his Foam-51D, the FoaMe-109, the FoamWulf-190D and the Kawafoamie Ki-61.

I've flown a dozen DAW combat foamies and own two myself. These bounceable planes are designed first for combat survivability, second for light air flight performance and third for appearance. They launch easily, fly well in wind from 10 to 25mph and have outrageous maneuverability. Optimized for "turn and burn" flying, the DAW foamies make excellent slope aileron trainers in addition to their "fighting foam" primary role. Because they are finished with iron-on covering, you can make them as pretty or as accurate or as detailed as you wish, using only your "cote" iron.

Other makers have begun to produce EPP foam PSS planes, including Aerofoam,* who make an EPP-foam F4U Corsair kit, the "bent wing warrior" of WW II Pacific theater fame and an A-10 Warthog ground-attack plane.

Studio B Design and Production* make a combat-scale, EPP-foam MiG-3, which looks terrific in a Russian "Moscow" red and white color scheme, and an A. V. Roe Vulcan bomber, which you may remember

A Paul Masura Bede BD-5 built and flown by Carl Maas at Cajon Summit in central California. Photo by Joe Chovan.

from the opening scene of the James Bond movie, "Thunderball."

THE FUTURE FOR PSS KITS

PSS kits are being introduced at an increasing rate as more flyers and more makers become aware of the joy, excitement and relatively low cost of flying power slope scale. You have plenty of choices if you want to try PSS.

Mark Mech at Aerofoam has a Lockheed U-2 Spyplane in the works, plus a very scale 72-inch-span A. V. Roe Vulcan. Starting out as a high altitude A-bomber, with its fighter-like maneuverability, it became a low-altitude bomber and was last used in anger in the Falklands' war. The Vulcan remained in service until 1992 and was always a British airshow heart-stopper.

Dave Sanders of Dave's Aircraft Works has announced a Messerschmitt Me 163 rocket plane in combat scale, and has plans available for those who would like to build a B-24 Liberator or a B-25 Mitchell bomber from scratch.

This winter, designer Ken Williams at K&A Models Unlimited will release scale kits of the Focke-Wulf Fw 190, Supermarine Spitfire MkXXIV and the Messerschmitt Me 109J. The new planes have clear canopies and vacuum-formed cockpit floors for scale detailing opportunities. With fiberglass fuselages and built-up wings, they are designed to fly in lift as light as 7mph. On the drawing board for release in 1998 are 1/12-scale, 48-inch span models of the Me 262, F-86 Sabrejet and the MiG-15 Fagot jet fighter.

Fans of modern Navy fighters will be pleased to know that Patterick's has started shipping the Aero Model Design Grumman F-14 Tomcat, "defender of the fleet." The kit is highly prefabricated with fiberglass fuselage and pre-sheeted balsa over foam wings and a clear canopy.

In addition to single-engine 1940s piston fighters, Slope Scale has flown prototypes of the Embraer Super Toucano, a Boeing B-17 Flying Fortress, a Lockheed P-38 Lightning and the Bede BD-5 "Coors Light" personal jet.

Jerry Teisan at Trick R/C* has flown a prototype of the B-2 Stealth Bomber and is considering kitting it.

Lex Liberato at Studio B Design and Production has flown a prototype P-38 Lightning, the "fork-tailed devil," and is working on a B-1 bomber foamie. Also on the drawing board is a 60-inch-span composite MiG-3.

Merrill Brady at MM Glider Tech,* now kitting an EPP foam F-86 Sabrejet, will soon produce its adversary, the MiG-15 Fagot, giving us the main ingredients for a Yalu River Reunion.

Brian Laird prepares to launch his Slope Scale P-40 Warhawk at Pacifica, CA. Photo by Carl Maas.

Preparing to launch a Boeing B-29 with a Bell X-1 rocket plane slung below. The model was built by the Nampa (ID) Model Aviators and was photographed by Dave Garwood at the World Soaring Jamboree in 1994.

Mostly we've discussed planes that come in kits, but for scratch-builders, note that Bob Holman Plans* can supply plans for many PSS designs. Examples of piston airplanes are Focke Wulf Fw 190D, P-39 Aircobra, Supermarine Spitfire, Yak-9 and a four-engine Lockheed Constellation. His jets include Heinkel P-212, Su-25 Frogfoot, Boeing B-52, A. V. Roe Vulcan, a BAe Lightning, Panavia Tornado, a Lockheed F-104 Starfighter and many more.

Finally, if muscle-powered flight qualifies in your mind as PSS, take a look at one of the most unique slope planes I've ever built and flown—Steve Hinderks' R/C Gull. It looks truly amazing in the air. The R/C Gull is available from The Birdworks* as plans or a semi-kit—containing a beautiful fiberglass body, white foam wing cores, plans, instructions and eyeball decals.

**Addresses are listed alphabetically in the Index of Manufacturers on page 158.* +

SR Because the best radio gear... ...is no better than its batteries!

Most of you have heard of SR Batteries. You've probably even heard that we make great battery packs. However, you've probably also heard that our packs are more expensive than the packs from "the other guys."

Well, it's true. We are more expensive... because we're better!

For over 15 years we've made the best custom packs you can buy. We've done it because we're modelers and we want to be proud of what we do. We also want to save you some airplanes.

You're probably not aware that most of SR's business is in the military/aerospace industry. Our customers include NASA, Lockheed, Boeing, the Army, Navy, Marines and Air Force, the Jet Propulsion Laboratory, The Hubble Space Telescope, the Space Shuttle Program, the Mayo Clinic, Johns Hopkins University, AeroVironment, and the Harris Corp. to name just a few.

We're really proud of our newest project. SR was selected as the only company to make the emergency backup battery packs for Northstar's new M3, IFR panel mount GPS for General Aviation.

You're probably wondering why we make packs for the R/C field when we have so much to do for the military/aerospace industry. It's simple. The President of SR Batteries, Larry Sribnick, has been a serious modeler for well over 40 years. To him, your aircraft is no less important than any of the other projects we work on. We try to employ modelers whenever possible and the cardinal rule is, "If we wouldn't feel comfortable about using a pack in one of our own airplanes, we don't let it get out the door!"

OK, it's time for specifics. What does SR do in making a pack that no one else in the R/C field does?

All SR cells are *screened and matched Aerospace Grade cells*. These are not your usual consumer type inexpensive cells. They are exactly the same cells we use for our military/aerospace applications.

Only SR *guarantees* its cells and packs not to ever form a memory and warranties each pack for one year.

Only SR puts *every* pack through five days of electronic testing to make sure every pack is perfect. These tests include a test of capacity, charge retention, and a vibration test for mechanical integrity.

All *welded* internal and external construction. Would you believe that some companies sell cells where the internal connections are nothing more than a press fit? We don't even have soldered connections, except for the connector leads themselves.

Even the straps we weld from one cell to another are an SR exclusive. Each strap is strain relieved so that no vibration or stress is transmitted to the welds at the end of each cell. No one else has this feature!

All SR packs can be fast charged. Of course no cell will stand up to extreme overcharging but all SR cells have the lowest possible internal impedance so that fast charging isn't a problem.

All SR packs give you more flying time with less size and weight. Our packs are continually growing in capacity while shrinking in size and weight. Our 1000 Series receiver pack, for instance, is smaller and lighter than the standard 500mah pack that comes with many new radio systems, but it has twice the capacity and flying time.

No other company gives you the range of receiver and transmitter packs that we do. We never have to try to "fit a round peg into a square hole" because we don't make a particular size cell. Our cells range from 50mah to 10,000mah in capacity.

Custom packs. Now, that's what we're all about. While other companies force you to buy what they make, we sell you what you want. A 5 cell pack rather than a 4 cell pack? No problem! 36" leads on the pack? No problem! A special shape pack? No problem! A JR and Futaba connector on the same pack? No problem. You name it, we'll do it. And, normally, at no extra cost!

Did you ever try calling the "other guys" with a technical question? Did anyone there have any idea of what you were talking about? Only SR maintains a Hotline phone number, 516-286-0079, where you can call for help with any R/C problem or question, battery related or not!

Using SR packs, thousands of contests have been won, national and world records set, and national championships awarded to modelers around the world. A short list of just some
of our customers would include: Bob Aberle, Joe Bridi, Dave Brown, Byron Originals, Hal DeBolt, Bob Dodgson, Dr. Walt Good, Robert Gorham, Dick Kidd, Ivan Kristensen, Don Lowe, Eloy Marez, George Myers, Dean Pappas, Dave Platt, Nick Ziroli, etc., etc.!

If you'd like more information or have a question, drop us a note at SR Batteries, Inc., Box 287, Bellport, NY 11713, Fax: 516-286-0901, Email: 74167.751@compuserve.com or call 516-286-0079 between 9am and 5pm Monday through Friday, Eastern Standard Time.

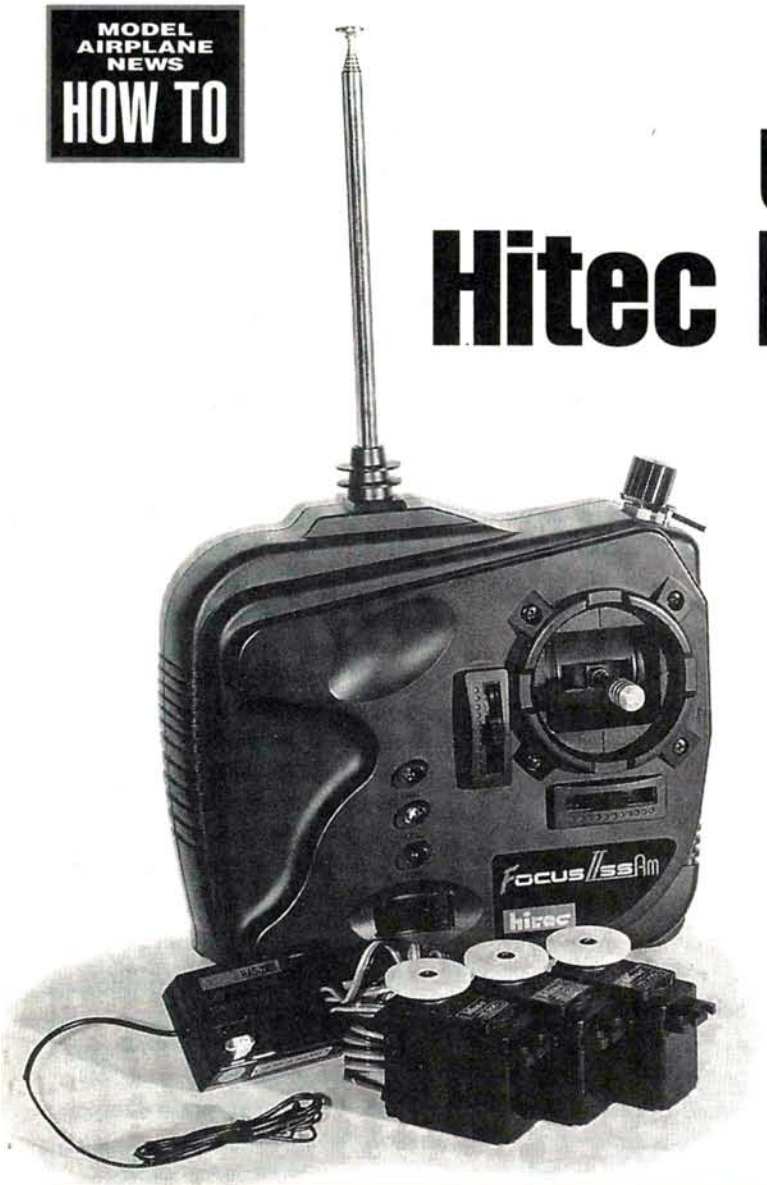
Remember, *the best radio gear is no better than its batteries!*

-ADVERTISEMENT-

MODEL AIRPLANE NEWS
HOW TO

Upgrade your Hitec Focus IIss to Three Channels

by ALAN McSWAIN



I'VE NEVER BEEN quite sure whether I should consider it a blessing or a curse, but I have always been one of those people who simply can't own anything without taking it apart to see what's inside to figure out what makes it "tick." So, of course, it was business as usual when I recently bought one of the new Hitec* single-stick 2-channel radios from my local hobby dealer. As soon as the new radio hit the bench at home, out came the screwdrivers, and within minutes, I was rewarded with a pleasant surprise. This radio was originally designed to be a 3-channel system! All that was missing was a thimbleful of parts and a few minutes of soldering time. By bedtime that same day, I had completed the "upgrade" to my radio and I have been enjoying it ever since.

RECEIVER PARTS REQUIRED

(1) .25 three-pin IDC header Digi-Key* no. S1011-03-ND—$0.75

(1) .0047mfd @ 16V chip capacitor Digi-Key no. PCF1072CT-ND—$4.39/10

TOOLS REQUIRED

Small and medium Phillips screwdrivers

Hobby knife with a new no. 11 blade

Wire strippers

Soldering iron with a 1/16-inch tip or smaller

.032 diameter 60/40 rosin-core solder

Static-free workbench

TRANSMITTER PARTS REQUIRED

(1) DPDT Sub-mini slide switch Radio Shack 275-407a—$1.49/2

(1) 5K-ohm linear taper potentiometer (.6 inch body diameter, .125 inch shaft diameter) Digi-Key no. CT2204-ND—$2.60

(1) Suitable knob to fit potentiometer Digi-Key no. 8554K-ND—$3.24

(1) 22K-ohm (22,000 ohm) chip resistor Digi-Key no. P223ACT-ND $1.10/10

(1).01mfd @ 16V chip capacitor Digi-Key no. PCF1076CT-ND—$4.39/10

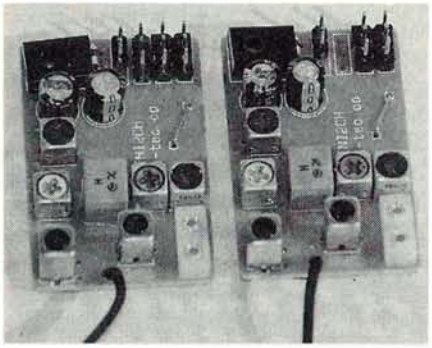
(1) 1-inch piece of Kaynar or equivalent fine wire wrap wire

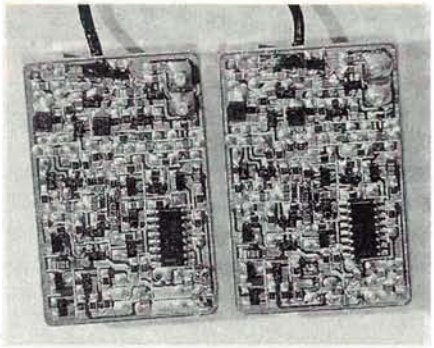
(1) 5-inch length of three conductor servo wire or equivalent

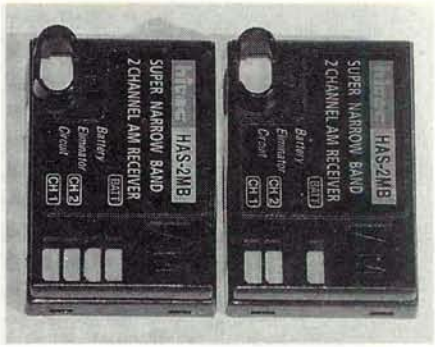
(1) Long servo arm, scrap plastic or plywood

(2) Servo-mounting screws

Apart from needing a soldering iron with a smaller than usual tip, the needed tools can be found on most workbenches.



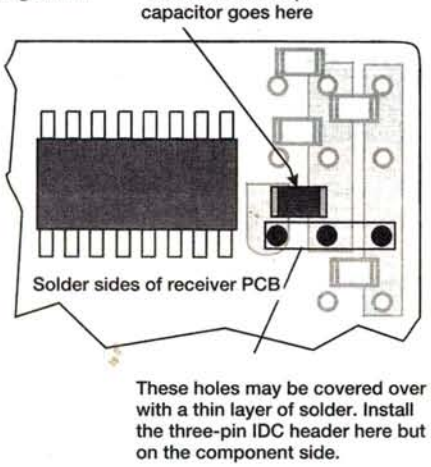




Left: the "component" side of the Hitec 2-channel receiver. The upgraded board is on the left. Note the addition of the three-pin IDC header. Center: the "solder" side of the receiver with the upgraded board on the left. Note the barely visible addition of the 470pfd-chip capacitor near the upper right corner of the IC chip. Right: although a bit tedious, work slowly and carefully while making the hole for the servo connector in the receiver's upper case half. Note the small 45-degree bevels that act as keys.

Warning: the modifications illustrated in this article, if performed on a unit still covered by the manufacturer's warranty, will likely constitute suitable grounds for the warranty to be voided. *Proceed with this modification at your own risk.*

Diagram A



RECEIVER MODIFICATION

Modification of the receiver is quite easy because it involves only two parts and a little hobby-knife work. First, remove the receiver crystal from its recessed molding and set it aside. Now remove the polycarbonate plastic case from the receiver by lightly pressing inward on the two small tongue latches on the antenna-wire exit end of the case, one at a time, while you apply finger pressure to separate the case halves. A small jeweler's screwdriver is an excellent tool for this task. Extract the printed-circuit board (pcb) from the lower case half by pulling firmly on the antenna wire. Set it down in front of you, solder side up, with the antenna wire to your left. In what is now the upper right-hand corner, locate the two, three-pin servo lead IDC headers. Just below these two, you will notice what seems to be an empty spot that's just the right size for an additional header, but without any soldered pins protruding.

USING A SWITCH INSTEAD OF A POTENTIOMETER

If you would rather have a 2-position toggle switch instead of a lever-action potentiometer, it's a snap to modify the design. Just remember that the control range of the 5K-ohm voltage divider is between 2K and 3K ohms. This means you'll need a single-pole double-throw switch, two 2K-ohm and one 1K-ohm ¼W carbon film resistors. Wire them up according to the diagram and substitute the assembly for the 5K-ohm potentiometer.

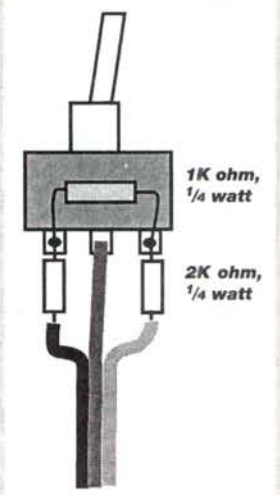
The unit is wave soldered, and the three holes that should be there may be covered by a thin layer of solder. To uncover the holes, simply use the tip of your soldering iron and brush the excess solder slightly

WHAT EXACTLY ARE WE DOING TO THESE CIRCUITS?

The receiver. The three-pin IDC header just provides a physical connection for the third servo to the battery supply and the servo signal line. The 470pfd-chip capacitor is wired from the signal line to ground indicating that it is a high-frequency noise bypass to ground. In other words, if electrical noise from the motor in the servo finds its way onto the signal-line wire, this capacitor provides that noise with a quick path back to ground, preventing it from entering the receiver's circuit and interfering with its operation.

The transmitter. Electronically speaking, the transmitter modification parts comprise the third "one-shot" generator for the "modulated width" pulse-train circuit of the Philips NE5044 7-channel ppm (proportional pulse modulation) integrated-circuit chip, which forms the heart of the Hitec IISS transmitter. Metaphorically, you are adding one more box car to a train consisting of one locomotive (the "sync" or "frame" pulse) and two box cars (the channel 1 and 2 pulses). Moving the stick on the radio makes the box cars (pulses) longer or shorter, thus "encoding" the proportional movement of the sticks.

Part by part, the 5K-ohm pot is wired as a voltage divider whose output (the pot's center tap) is connected to the channel-3 input (pin 3) of the NE5044 chip through the 22K-ohm chip resistor. Much like the 470pfd capacitor in the receiver, the .01mfd capacitor is also wired to bypass any electrical noise picked up in the voltage divider circuit to ground. The double-pole double-throw switch is used to invert the polarity of the reference voltage generated by the NE5044 (pin 15) that is applied across the 5K pot voltage divider circuit. It is the reversal of this reference voltage polarity that reverses the servo direction.



ADDITIONAL HOP-UPS FOR YOUR HITEC IISS RADIO

Once you've added your third channel, the next question you'll be faced with is "What do I plug into it?" Fortunately, there are many inexpensive, yet highly durable, servos on the market to choose from. The most obvious choice should be another Hitec HS-300 with a street price of about $13. This is a good choice for larger aircraft, but if your intended use of channel 3 is throttle control, you might want to consider the Hitec HS-101 miniservo instead. Although it is almost twice the price of the HS-300, the weight difference is considerable and its smaller size makes it easier to install. For really small applications, consider Hobby Shack's* new Cirrus CS-20 BB sub-microservo. Weighing in at a little over 1 ounce, this tie-tack-size servo still delivers about ¼ of the torque of a standard servo!

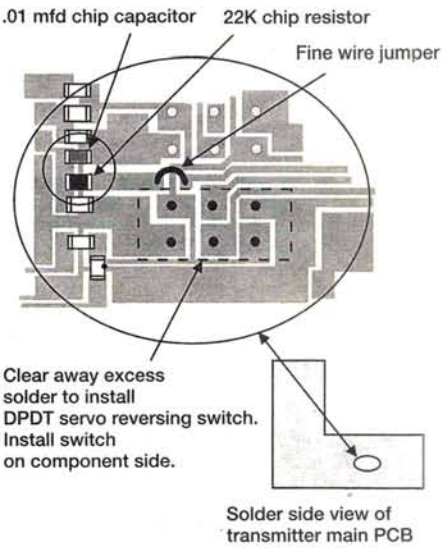
Another upgrade you easily can make is to outfit your IISS system with rechargeable Ni-Cd battery packs. An excellent choice for the transmitter is Cermark's* 800mAh pack. This pack will provide 60 percent more flight time than standard 500mAh Ni-Cd cells. Ideal for most small aircraft applications, Cermark's 270mAh airborne pack is another high-quality weight saver. Don't forget to order the correct connectors, too.

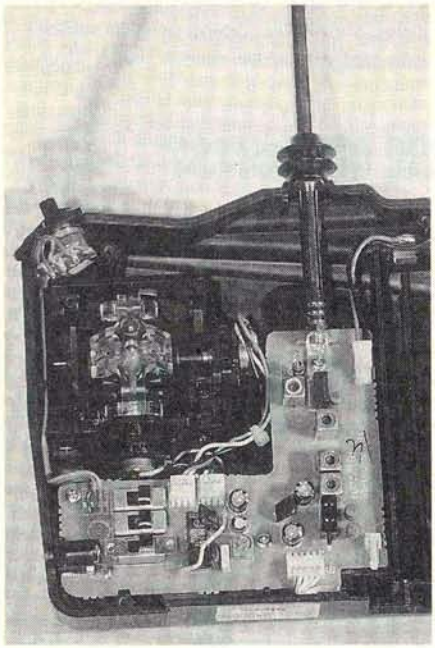
Additional upgrade options for your Hitec radio. Servo choices from left to right: Hitec HS-101, HS-300 and Hobby Shack's new cutie, the CS-20 BB sub-micro. Converting to Ni-Cds makes flying more economical. Cermark Model Supply's 800mAh transmitter pack and a lightweight 270mAh airborne pack.

to the side until the holes are revealed. Now install the three-pin IDC header on the component side of the board and solder one of the pins on the other side. Double-check that the pin is perpendicular to the circuit board before soldering the other two pins. Tin both ends of the 470pfd-chip capacitor and, referring to Diagram A, locate the position for the .0047mfd-chip capacitor, and solder it lightly, gently and quickly into place. Hint: the robotic assembly machine that these pcbs were assembled on was programmed to place two little red dots of epoxy straddling the position of every chip resistor and capacitor. When the Hitec engineers changed the design from three to two channels, they programmed the "pick-and-place" robot to skip the 470pfd-chip capacitor and the three-pin IDC header, but apparently, it wasn't worth their time to reprogram the epoxy-dot program. So just find the two little, red epoxy dots, and that's where your 470pfd-chip capacitor goes!

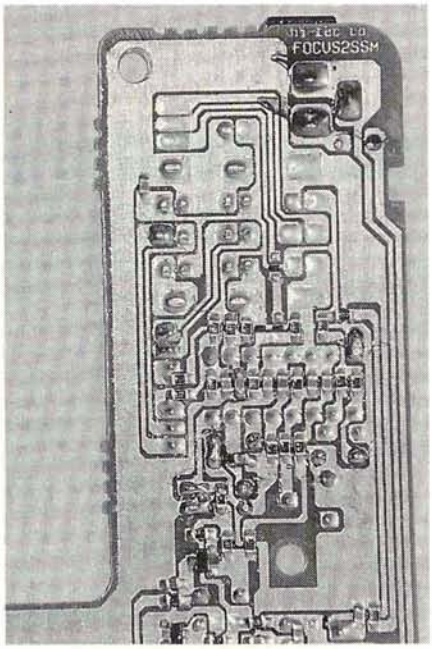
With the electronic mods completed

Diagram B





After the modifications have been completed, your unit should look like this just before you put the case back on.



The transmitter's pcb solder side before upgrading. Refer to Diagram B for part locations.

and your hobby knife in hand, proceed to open a servo-plug hole in the upper half of the receiver case directly above the IDC header you just installed. Be sure to duplicate the exact shape of the other holes, or you will make it possible to plug a servo into your third channel backwards, and that could cause damage to both the servo and your receiver. Snap the circuit board back into its case and replace the crystal. You now own a 3-channel receiver!

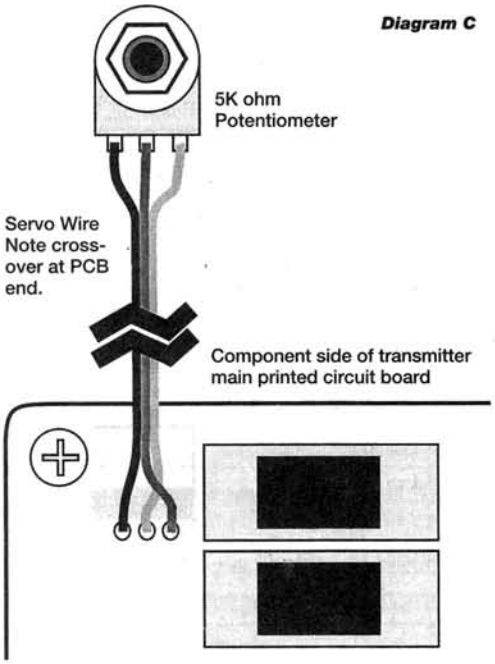


Diagram C

TRANSMITTER MODIFICATION

Remove the transmitter crystal, the antenna, the battery hatch, the battery cassette and the four case screws. Place these parts in a Baggie or Dixie cup for safekeeping. Remove the transmitter case back and set it aside. The main transmitter pcb is held down with three screws; remove these and set them aside.

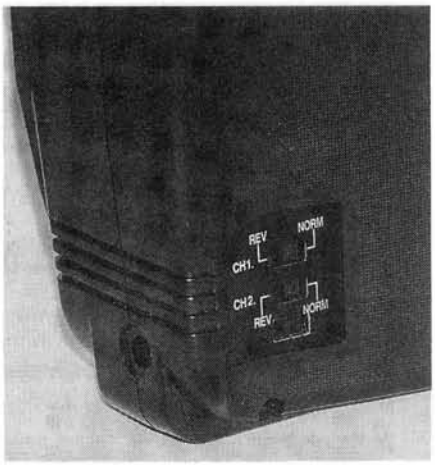
Using a Sharpie pen or similar indelible marker, label each of the four off-board connectors with a number, and write that number on the pcb surface next to the connector. Disconnect the four connectors and lift the pcb free of the case. Using Diagram B as a reference, solder the Kaynar jumper, the 22K-ohm chip resistor and the .01mfd-chip capacitor in place. Solder the servo-reversing switch in place making sure that the height of the switch lever matches the other two switches. Tin and solder the 5-inch servo wire to the 5K-ohm potentiometer (pot) noting that the center wire goes to the center tap of the pot.

Now, solder this assembly into the main pcb at the empty connector location in the upper left corner of the component side. Note that the center wire is swapped (crossed over) with the wire on the right side of the empty connector location—which is the side closest to the other connectors (see Diagram C). Remove the control-stick assembly and set it aside. Drill or melt a suitable mounting hole for the pot in the upper right corner of the case and install the pot.

Replace the stick assembly and remount the pcb. Reconnect the four off-board connectors. Tuck the servo wire leading to the new control pot along the left side of the stick assembly so it won't get into the stick mechanics.

Position the back of the case and, working from the inside with your hobby knife, patiently score through the aluminum trim sheet that covers the molded hole for the 3-channel servo-reversing switch. Finally, replace the back of the case, battery cassette, battery hatch, crystal and antenna. Test the modification.

Detail of the ugly yet functional throttle lever for the new third channel. Servo screws set the travel limits, and small cuts added to the end of the scrap servo arm provide a non-slip surface for your go-faster finger.



Above: patiently scoring the aluminum trim sheet from the reverse side with a no. 11 hobby blade will be rewarded with a fine hole for your channel-3 reversing switch.

Remember, you are only going to use the center fifth of the pot's resistance, which translates to about 70 degrees of rotation. Once tested, fashion a suitable lever assembly out of a knob and some scrap plastic (servo arms work great). At last, with your lever arm in place, add a few servo-mounting screws to physically limit the arm travel. Well done, and happy flying!

Chip capacitors and resistors can be difficult to find in single quantities in non-urban areas. If you would like a short kit of parts (except the switch, pot and knob) please send me a stamped, self-addressed envelope and $2. For a complete kit with expanded step-by-step instructions, send $13 to Alan McSwain, 3528 West Flower Ave., Fullerton, CA 92833.

**Addresses are listed alphabetically in the Index of Manufacturers on page 158.*

TIPS ON SOLDERING "CHIP" SIZE PARTS

Jewels of miniaturization, chip capacitors and resistors make tiny, highly reliable circuits possible but they can also be a handful to work with. Start by anchoring the pcb down with one of those alligator-clip workstands, or, in a pinch, simply rubberband the pcb to a larger block of wood. The circuit pads where the part is to be soldered should be tinned, but without any excess solder visible. Hold the chip component in its mounting position with a pair of tweezers. Quickly touch the tip of your soldering iron to a small strand of solder until it picks up a tiny ball. Now touch the tip of this "wet" soldering iron to one end of the chip part and its underlying pad. Pull the iron away as soon as you see the solder wick between the chip part and the pcb. If the tweezers moved and you're not happy with its position, re-flow the solder and reposition the part. This joint is just temporary, so don't worry if it looks cold or crusty. Next, using a fine strand of solder, attach the other end of the chip part to the pcb. Now, go back and re-flow the first joint if needed.

MODEL AIRPLANE NEWS

FIELD & BENCH REVIEW

A sport model that thinks it's an advanced fighter

AFTER BUILDING THE Altech* F-14 Tamecat designed by Jeff Troy, I looked forward to doing Altech and Jeff's latest project, the F-22. The kit comes in ARF and ARC versions and, because I'd rather spend time at the field instead of in my shop, I chose to build the ARF model, which comes covered with Coverite and painted. The F-22's construction is unique; both the fuse and wing are solid foam and sheeted with balsa. The kit includes a good instruction manual and a hardware package that contains all the necessary pushrods, clevises, wing bolts and screws.

ALTECH MARKETING

F-22

by VIC OLIVETT

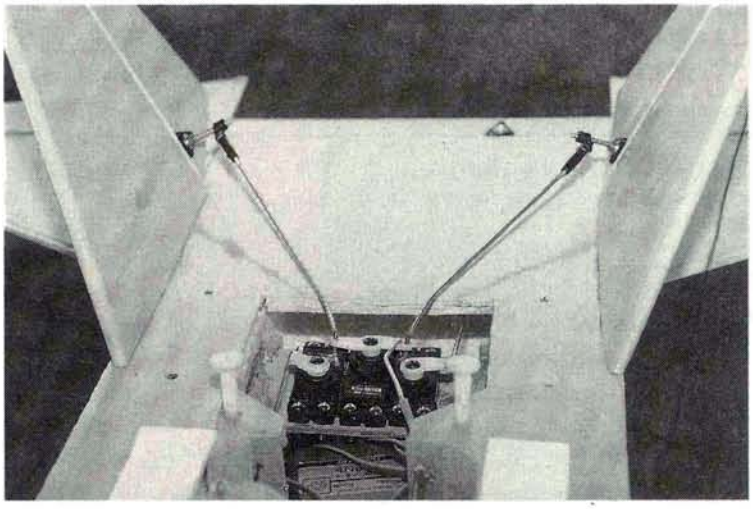
A very important point before getting started: do *not* use any CA adhesives in areas that contact foam. As with all ARFs, check all of the factory's glue joints. I found that the rear bulkhead, where the threaded wing-bolt blocks were mounted, needed some reinforcing.

TAIL FEATHERS

Remove the covering over the slots at the rear of the fuselage (there are two for the vertical fins and two for the horizontal stab). I also removed the covering on the fuselage, both in front and to the rear of each fin, to provide more gluing surface. I used Z-Poxy* to glue the tail feathers to the fuselage. To ensure proper alignment, hold the assembly in place with masking tape until the Z-Poxy cures. I temporarily hinged the elevator in place to hold the horizontal stab for gluing. I had to use a Dremel tool to remove a small portion of the foam at the rear of the fuselage for elevator control horn clearance.

FUSELAGE

The radio compartment is covered with an 1/8-inch plywood plate and is held in place with four screws. The rear of the plate has two openings for the rudder pushrods. These may have to be enlarged, depending on the type of servos you use.



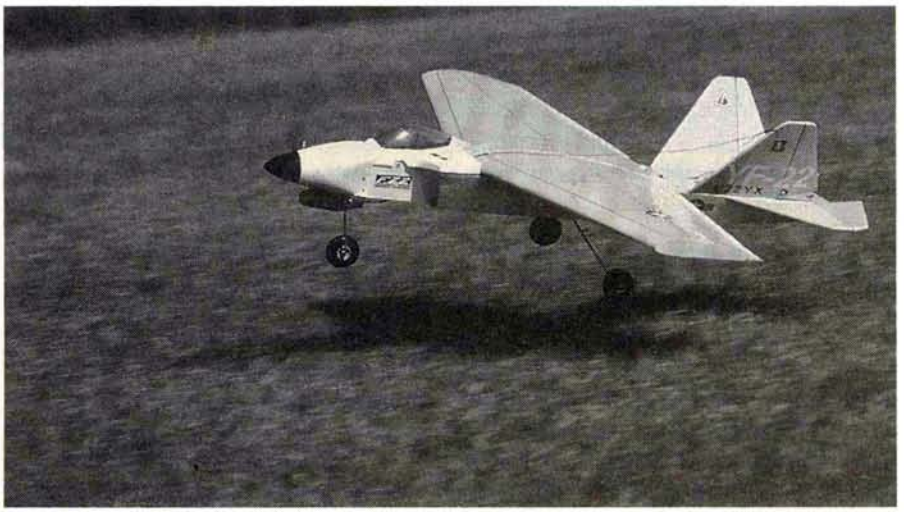
With the aft radio compartment hatch removed, you can see the simple linkage setup. The RX battery is placed just in front of the servo tray.

ject and had to make the steering arm exit under the fuselage. The front of the fuselage is glued with Z-Poxy to the main portion of the fuselage. I used 1/4x1/4-inch pieces of scrap balsa to hold the front portion of the fuselage tight against the sides of the rear portion while the glue cured. Medium Zap worked well for the cowl mounting blocks.

WING

The wing panels are sheeted foam and are very well made. They are joined using two 3/8x6-inch dowels. After I was satisfied with the fit of the wing joint, I applied a liberal amount of 30-minute Z-Poxy to the wing roots and inside the joiner holes for the dowels. After the panels are joined, wipe away any excess epoxy with rubbing alcohol and a paper towel. The wing is allowed to cure upside-down with a block at the rear of the trailing edge (TE).

The two aileron torque assemblies are placed into the slotted TE pieces and then glued to the TE of the wing. Add some clearance so the torque rods can move smoothly. When you're satisfied with the fit and movement of the torque-rod assemblies, glass the center section of the wing with 30-minute Z-Poxy. All the control surfaces have been slotted for the CA hinges. Pre-fit the ailerons and check



Coming in for a landing, the F-22 is easy to control and slows down nicely. Yaw control with those big twin rudders is very positive.

The landing-gear block is already installed and drilled. Just remove the covering and add some Zap-A-Dap-A-Goo* to prevent fuel from seeping under the covering and screw the two metal straps in place.

The engine mount you use will determine the location of the nose-gear bearings. I used an Enya* .50 CX for this pro-

PHOTOS BY WALTER SIDAS

SPECIFICATIONS

Model: F-22 Lightning

Manufacturer: Altech Marketing

Type: intermediate-level sport acrobatic ARF

Wingspan: 53 1/2 in.

Length: 44 in.

Wing area: 650 sq. in.

Weight: 5 1/2 to 6 1/2 lb. (5 3/4 lb. as flown)

Engine req'd: .40 to. .60 2-stroke or .53 to .80 4-stroke

Engine used: Enya .50 CX

Channels req'd: 4 (aileron, elevator, rudder & throttle)

List price: ARC, $189.98; ARF, $269.98

Features: balsa-sheeted foam construction; complete hardware package; simple, well-illustrated instruction manual.

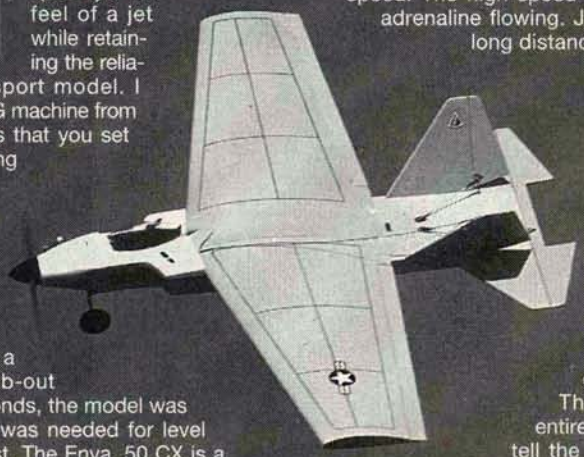
Comments: Jeff Troy has done his homework on this one. The design is exceptional, and construction time is minimal.

Hits
- Excellent instruction manual.
- Strong construction.
- Great stability.

Misses
- Soft material on landing gear (has since been corrected by Altech).

FLIGHT PERFORMANCE

The F-22 is designed to give the Sunday sport flyer the feel of a jet while retaining the reliability of a mid-level acrobatic sport model. I balanced the model with the new CG machine from Great Planes*. Altech recommends that you set the CG at 5 inches from the leading edge of the wing at the root.



• *Takeoff and landing*

The takeoff is smooth and straight down the runway, and, with just a touch of up-elevator, the F-22 lifts off with just a slight nose-up attitude. The climb-out was perfect and quick. Within seconds, the model was in the groove. Absolutely no trim was needed for level flight. At ⅔ throttle, the F-22 is fast. The Enya .50 CX is a powerhouse and pulls the model with authority.

Landings are a breeze. Just set up a good final and ease back the throttle, and the F-22 settles in for a smooth, nose-high landing.

• *High-speed flight*

After you get the feel of the model, you'll feel the need for speed! The high-speed runs are exciting and will get your adrenaline flowing. Just remember that you will cover a long distance in a short time. Full-power climbs are almost vertical.

• *Low-speed flight*

The model slows down very well without losing any stability. It has no tendency to fall off at slow speed. The stalls are straightforward, and recovery is just a matter of adding a little power.

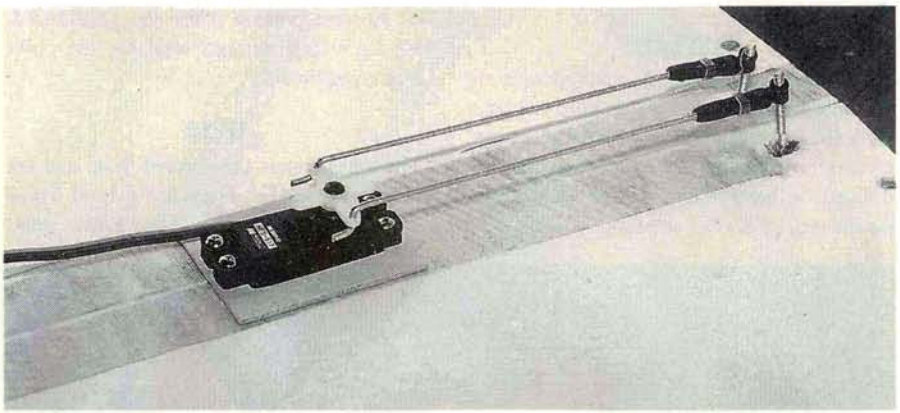
• *Aerobatics*

The size of the loop only depends on how far back you pull the stick. The model tracks well through the entire maneuver. Split-S's are a ball; just tell the F-22 what to do and sit back and enjoy. The rolls are fast and quick when on high rates. Those low passes that finish with a roll are my favorite: one, two or three, it doesn't matter. The model will not lose altitude.

for proper movement. The precut servo hole may have to be enlarged, depending on which servo you use.

When I aligned the wing to the fuselage, I found that the blocks for the wing bolts needed some added support. I used a piece of ⅛-inch ply to secure the block to the foam in the fuse and added some 30-minute Z-Poxy. After the wing is bolted into place and alignment is correct, hold the front of the wing tight against the fuselage and drill the ¼-inch holes through the front bulkhead and into the front of the wing.

For power, an Enya .50 CX burning Byron* premium Sport 10-percent nitro fuel was used.



Aileron linkage is a traditional torque rod setup and takes only a short time to assemble. Roll control is very good.

The ABS cockpit deck is fastened to the fuselage using brass eyehooks and rubber bands. This system works very well; however, depending on the type of tank you use, some adjustment to the eyehook in the cockpit deck may be needed.

ENGINE AND RADIO

I chose to use the new Enya .50 CX to power the F-22. This engine is in the new high-performance CX line. The engine fits well into the cowl with a little Dremel tool work.

I also used a JR XP642 with NES 517 servos. The new generation of radios is great; this one features servo reversing, end-point adjustment and expo, which make radio installation easy. The F-22 comes with all the pushrods and clevises needed for the installation. All the control surfaces were set as per the instructions for the initial flights.

CONCLUSION

The nice thing about a modeler designing a model is that he knows what we need and what we want: performance, reliability, ease of construction and low maintenance. Jeff Troy and Altech Marketing have done all of the above with this winner. This model will get your heart pumping and make you look like a pro. Whether you're a novice or an expert, you will really enjoy building and flying the Altech F-22.

**Addresses are listed alphabetically in the Index of Manufacturers on page 158.* ✚

The Second Great R/C Design Con

IT'S SOMETIMES SAID that there's a creative genius inside every modeler; we agree. When the Second Great R/C Design Contest, co-sponsored by Global Hobby Distributors and Model Airplane News, was announced in our February '97 issue, many very talented readers immediately sat down at their drawing boards and started to work. Only designs that had never been published or manufactured qualified for this contest—although there were no restrictions on the type of R/C plane design submitted—and only non-professional and non-commercial modelers were eligible. We salute the modeling genius in all of the entrants and after carefully considering all the designs, we're proud to present the winners. We look forward to featuring these unique models in future construction articles. Stay tuned!

1st PLACE SLINGSHOT

Keith Lindsay of Kadena Air Force Base in Okinawa, Japan, won $1,000 worth of his choice of Global Hobby Dist. merchandise for his unique Slingshot pusher design. Keith writes that he wanted to "design and build something that nobody else had modeled before," and subsequently found an article about a Kolb Aircraft ultralight airplane in a magazine. After Kolb provided some 3-views, Keith was in business. He tells us that with a .20-size 4-stroke, the model performs like a trainer but can handle basic aerobatics. Congratulations, Keith, and *Model Airplane News* looks forward to featuring your design in a future construction article.

2nd PLACE T-34 C MENTOR

The winner of $700 of Global Hobby products, Karl Blumenberg of Elmont, NY, designed this .25-size, sport-scale T-34C Turbo Mentor. The 46-inch-span model is a balsa and ply construction, weighs 3.6 pounds and features a home-made, vacuum-formed canopy and an engine and muffler that are enclosed in the cowl. Karl writes, "My major interest is in sport or fun-scale aircraft that tend to be easy flyers." Well, Karl, if your Turbo Mentor flies as great as it looks, you've succeeded!

3rd PLACE DOUBLE TROUBLE

This twin push/pull sport design won Tony Newsom of Oakland, CA, $500 worth of Global products. The model has a 51-inch wingspan and features two .25 engines (spinning 9x6 propellers) mounted on each end of the fuselage. Tony tells us that the 5.5-pound model can fly with a standard radio and four servos.

Sponsored by Global Hobby Distributors and Model Airplane News

test Winners

Runners up

XDF-1 THUNDER

This .09-size sport ducted fan, "Thunder," was designed by John Bermudez of Norwalk, CT. It has a 30-inch wingspan and is 32 inches long. John wins $200 of Global hobby products for his design.

CL-415

Ed Westwood of Spanaway, WA, designed this semi-scale, twin-engine fire bomber around contrarotating .40 engines. The 75-inch model can drop 40 ounces of water and features flaps, pressure regulators and a water rudder. Ed says, "It flies extremely well, and even though I lost an engine on takeoff, it successfully flew a couple of circuits easily on one engine with only full opposite rudder trim." A gift certificate for $200 in Global products is on its way, Ed!

P2V-1 NEPTUNE

Gary Fuller of Claremore, OK, designed his .46-powered scale Navy "Neptune" from his own 3-views, which were created using photos and drawings from the Naval Air Museum in Pensacola, FL. The 100-inch-span model features Fowler flaps, is 77 inches long and uses 13 servos (one for each engine, two for ailerons, two for the fuel tank jettison, three for flaps, and one each for rudder, nose wheel and retracts). The model is all-balsa construction with foam-core tail surfaces and fiberglass nacelles. Gary will receive $200 in Global merchandise for his efforts.

FOKKER D-23

Doug Brauneck of Macon, GA, designed this .32-size push/pull scale twin around a Great Planes Ultra Sport .40 wing kit. He used TurboCAD to create plans for the model's fuselage and tail booms. Doug writes, "The Fokker is the best flying plane of my six current models and will take off, perform aerobatics, land and taxi with either engine; it's a real showstopper when both engines are running." We're pleased to send Doug a gift certificate for $200 worth of Global Hobby Dist. merchandise.

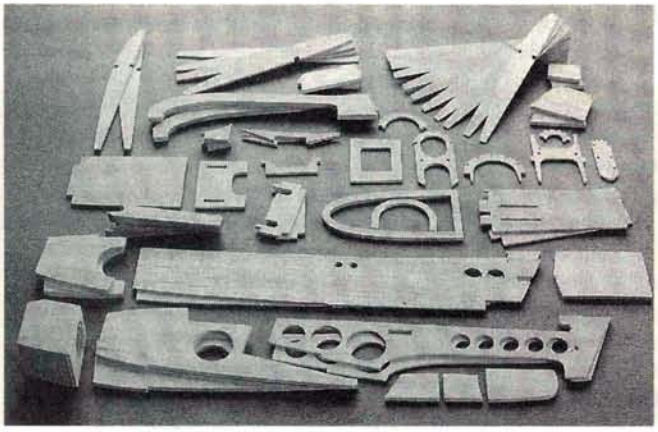
The CRACKLE

An .05 electric sport plane that can do it all

by STEVEN PAULEY

THE CRACKLE was designed to fill specific requirements. I wanted a plane that I could keep in my car and that would be ready to fly whenever I wanted. It had to be easy to assemble without tools. It had to be electric powered, and it had to look good. The Crackle meets all of these requirements and more; it was designed to be aerobatic and have powered flight times of more than 7 minutes.

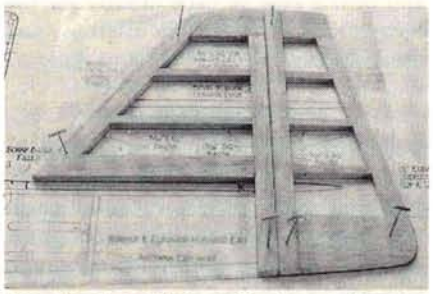
The Crackle uses an AstroFlight* 05 cobalt, direct-drive motor and a high-rate speed control—like the Ai/Robotics* FX35, which has a BEC for weight savings. You can also save weight by using microservos, lightweight covering material, a lightweight RX and contest-grade balsa for sheeting. Use hard or heavy balsa only for the turtle-deck stringers and main wing spars. Total flying weight should be 42 to 48 ounces. The Crackle employs standard, built-up building techniques using balsa and lite-ply. For easy identification, all the cutout parts are shaded with a wood-grain pattern on the plans. The actual building starts with the stabilizer, elevator, fin and rudder.



To speed construction and give you a good understanding of the Crackle's design, start by cutting out all parts, and make a kit.

TAIL GROUP

Cover the plans with wax paper and pin the 3/16-inch balsa fin and rudder pieces into place. Cut and pin the LEs and TEs of the fin and rudder to the plans, then glue all the parts together. Be careful not to glue the rudder to the fin. Finish the fin and rudder by cutting and gluing the 3/16-inch-square balsa braces into place. Follow



Use pins to hold pieces in place before you glue them together. This finished fin and rudder are ready for removal from the building board.

the same procedure for building the horizontal stabilizer and elevator. The elevator halves are connected with a music-wire joiner. Using the plan profiles as a guide, sand the fin, rudder, stabilizer and elevator to shape.

BUILDING THE WING

Build one wing half at a time. Begin by pinning the lower 1/16-inch LE sheeting to the plans, then pin the 1/16x1/2-inch lower TE strip into place. Cut and glue the 1/16-inch lower center sheeting into place from ribs 1 to 5 and part of rib 6. Cut the lower capstrips for ribs 6 through 11, and glue them into place. Mark the rib locations on the sheeting using the guide marks on the plans. Glue the lower spar to the LE sheeting using a straightedge to be sure it is straight. Glue ribs 3 through 11 to the spar, followed by the capstrips and sheeting between the spar and the TE. Note: do not glue the ribs to the LE sheeting ahead of the spar at this time. Glue rib 1 into place and tilt it 3/4 degree toward the wingtip to allow for the dihedral. Rib 2 will be added later.

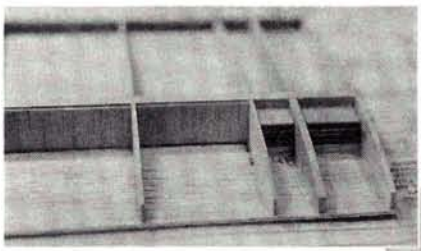
Glue the top main top spar to ribs 1 through 11. Glue the TE spar to the rear edges of the ribs and to the bottom TE strip. Then glue the top TE strip over the rib tips and the TE spar, flush with the TE. Keep the wing panel pinned to the plans at the root, and place a 3/16-inch spacer under the wingtip at the TE of rib 11. This will produce 1 1/2 degrees of wingtip washout. Keep this spacer in place as you continue with the wing sheeting. Lift the lower LE sheeting and glue it to the bottoms of the ribs ahead of the spars to help lock in the washout. (Recheck the washout after you cover the wing.)

Glue 1/16-inch shear webs to the backs of the spars between ribs 1 and 5 and on the front of the spars between ribs 3 and 9. Cut the rear half of rib 2 to fit into place between the shear web and the TE. Cut, trim and glue the lower balsa wing-hold-down spacer to fit tightly between ribs 1 and 3. When glued into place, it should be flush with the top of the lower main spar. Cut out the plywood wing-hold-down block and epoxy it on top of the spacer and the lower main spar. Now, cut and glue two lite-ply blocks on top of the plywood block. These blocks should fit snugly under the top main spar. Trim the front half of rib 2 to fit around the wing-hold-down blocks and glue it into place.

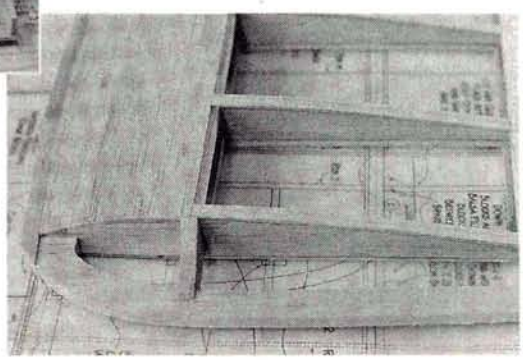
Keep the washout shim in place as you finish the rest of the wing sheeting. Glue the top balsa LE sheeting into place. Then cut and glue the top center sheeting in place. Now glue the top capstrips onto ribs 6 through 11. Remove the panel from the building board and sand the LE sheeting flush with the front rib tips. Sand the ends of the sheeting and the spars flush with ribs 1 and 11.

Glue on the LE. Cut it at rib 10 to make the bend, and leave about 1 inch of the stock sticking out past rib 11. This will be trimmed after the wingtip has been glued into place. Glue the 1/4-inch balsa wingtip and the wingtip brace into place, using the plans as a guide. The back edge of the tip will be tapered later to match the aileron.

Repeat the building steps above for the other wing panel; then glue both panels



Above: wing-hold-down blocks fit between ribs 1 and 3 and between wing spars. Rib 2 is cut to fit over wing-hold-down blocks. Right wingtip view showing the LE bend at rib 10 and trimmed flush with the wingtip. Note the vertical location of the wingtip and wingtip brace. The TE of the wingtip will be tapered to match the ailerons.



SPECIFICATIONS

Model name: Crackle

Type: sport electric

Wingspan: 46 in.

Wing chord: 9.75 in.

Wing area: 445 sq. in.

Weight: 42 to 48 oz.

Wing loading: 13.6 to 15.5 oz. per sq. ft.

Airfoil type: semisymmetrical S-2031

Length: 36 1/4 in.

Power: AstroFlight .05 cobalt sport w/7-cell 1400 to 2000mAh pack

Prop: Graupner 8x4.5 in. folding prop

No. of channels req'd: 3 or 4 (rudder optional)

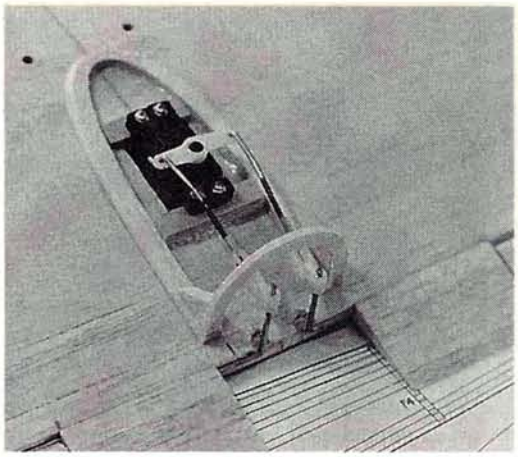
Comments: Designed by Steven Pauley, this conventional built-up balsa and lite-ply plane shows what an electric plane can do. For quick assembly, the wing is mounted to the fuselage with a unique slide-on design. The battery hatch allows easy battery replacement without the need to remove the wing. A thin, S-2031 airfoil contributes to high speeds and low drag. The wing is a built-up D-tube design with full-span ailerons. Many gas flyers are amazed that an electric-powered plane can fly this well and for the length of time that the Crackle does.

together with slow CA or epoxy. One wing panel should be flat on the building board, and the other should be tipped up 1 3/16 inch at rib 11 to set the proper 1 1/2 degrees of dihedral. Be sure that the wing halves are properly aligned; then sand the LE to shape and blend it into the wingtips. Spray the center joint area with 3M 77 adhesive and wrap the joint with 2 1/2-inch-wide fiberglass tape. Soak the tape with thin CA to bond it into place.

AILERONS AND SERVO HOOKUP

Cut a hole in the top of wing for the aileron servo. Do not cut away any more sheeting than necessary, as this will weaken the wing's center section. Glue 1/8-inch lite-ply scraps to both ends of the servo hole for the servo-mounting screws; then cut a small hole in the wing bottom to route the servo wire through to the RX.

Bend and fit the aileron torque rods to the wing TE. You will need to groove the TE to fit the torque rod bearing. I used Carl Goldberg* 3/32-inch aileron torque rods and horns, but others may also be suitable. Notch the TE so that the torque rods can move freely, then glue the aileron bearing into place. Cut two pieces of 1 1/2-inch balsa tapered TE stock to cover the aileron bearings. Groove the stock to fit over the exposed halves of the bearings, and glue them into place. Make two ailerons using 1 1/2-inch-wide tapered balsa stock. Bevel the LE of the ailerons, and drill a hole in each aileron for the torque rods. Trial-fit the ailerons, and check the movement of the torque rods.



The canopy frame fits around the servo and linkage. Before you cover the servo and linkage with the canopy, be sure that the ailerons operate properly.

BILL OF MATERIALS

Material	Quantity	Size	Use
Plywood	2 pieces	3/16x3/4x1 7/8 in.	wing-hold-down blocks
Lite-ply	1 sheet	1/8x12x12 in.	fuselage formers and doublers, wing hold-down, battery shelf, servo tray, upper canopy frame and battery-hatch former
Balsa block	1 block	1 5/8x1 5/8x2 3/16 in.	motor-mount block
Balsa sheet	6 sheets	1/16x3x36 in.	wing sheeting, ribs and capstrips
	1 sheet	1/8x3x12 in.	battery hatch and two ribs
	2 sheets	3/32x3x36 in.	fuselage sides and four ribs
	1 sheet	3/16x3x36 in.	forward fuselage doubler, lower canopy frame, stabilizer,elevator, fin and rudder pieces
	1 sheet	1/4x3x18 in.	wingtips, wingtip braces and motor-mount doubler
	1 sheet	3/8x3x6 in.	battery hatch sides
Balsa triangle strips	2 strips	1/4x36 in.	lower fuselage corner brace
Tapered balsa strips	2 strips	1 1/2x5/16x24 in.	tapered trailing edge/aileron
Balsa strips	2 strips	1/4 x1/2x36 in.	leading edge
	4 strips	1/4x3/16x36 in.	main wing spar
	4 strips	1/16x1/2x36 in.	trailing edge strip sheeting
	5 strips	1/8x1/8x36 in.	turtle deck stringers, stabilizer saddle and fuselage size braces
	1 strip	3/32x1/2x36 in.	upper fuselage longeron
	1 strip	3/32x1/4x36 in.	middle fuselage longeron
	1 strip	3/32x3/8x36 in.	lower fuselage longeron
	1 strip	3/16x1/2x36 in.	fin and stabilizer leading edge
	2 strips	3/16x3/8x36 in.	fin trailing edge, rudder leading edge, stabilizer, trailing edge and elevator leading edge
	1 strip	3/16x3/16x36 in.	stabilizer and fin braces
Miscellaneous			
Music wire	1 piece	3/32-in. dia.	elevator-joiner wire
Sig bubble canopy		11 in. long	
Velcro® strap	1		motor battery hold-down strap
Strip aileron	1 set	3/32 in.	aileron torque rods and hardware set horns
CA hinges	20 pieces		for ailerons, elevator and rudder
Fiberglass tape	1 piece,	2 1/2x20 in.	for wing center joint
Flexible pushrods	2 sets	36 in.	for elevator and rudder control
Nylon bolts	2	1/4-20	wing-hold-down bolts

FUSELAGE

Build the right fuselage side first. Pin the front and rear balsa fuselage sides to the plan over some wax paper. Cut to length and glue into place the top 3/32x1/2-inch longeron and the bottom 3/32x3/8-inch longeron between the front and rear fuselage sides. Then glue the 3/32x1/4-inch balsa longeron in place. Mark the locations of all formers and braces on the fuselage sides and longerons. Cut and glue an 1/8-inch-square balsa strip flush with the top edge of the upper fuselage longeron between the front edge of F1 and the rear edge of F6. Then glue an 1/8-inch square strip flush with the top edge of the stabilizer saddle area. Glue the forward fuselage doubler in place, then glue 1/4-inch triangle stock flush with the fuselage bottom edge from the rear of the doubler to the tail.

Cut and glue the 1/8-inch-square longeron braces at location "GG," location "II" and behind the pushrod exit slots; then fit the lite-ply fuselage doubler into place. You will have to sand this piece a little so it will fit correctly over the triangle stock. Before you glue, double-check that everything lines up. Now, glue the 1/4-inch balsa motor-mount bracket to the forward fuselage doubler. Cut and glue a piece of 1/4-inch triangle stock flush with the bottom edge of the forward fuselage doubler, but not on the motor-mount bracket. Build the left side of the fuselage the same as the right, except that after you glue the three

FLIGHT PERFORMANCE

• Takeoff and landing

Check the movement of the control the surfaces, then switch on the motor. Move the motor trim lever to full down. Holding your Crackle in one hand over your head, turn on the motor full throttle. Take a step forward and give the Crackle a good strong launch at about 10 to 15 degrees up. Hold the model level until it builds up a little speed.

Belly landings are easy; just remember to shut off the motor before the prop hits the ground. With the motor off, the prop will fold back as the Crackle slides to a stop. It will glide a long way on landing once in ground effect, so allow enough room.

• Low-speed performance

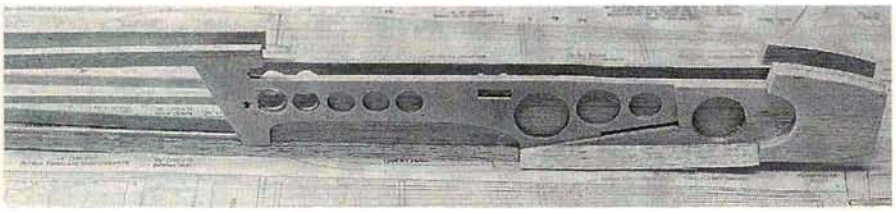
The Crackle will fly slow and steady with low throttle or with the motor off. I love to glide by a couple feet off the ground, completely silent, and sneak up on the glow flyers. The Crackle is capable of thermalling like a sailplane with the motor off and the prop folded.

• High-speed performance

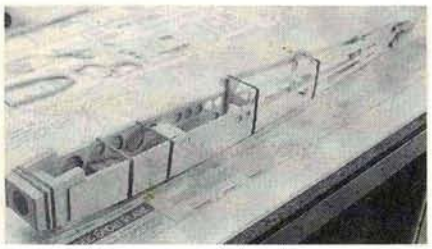
The Crackle is a good sport plane. Aerodynamically, it is very clean; it will pick up a lot of speed in a dive or with the motor at full throttle. Control is very crisp and quick at high speeds; the model has no bad habits.

• Aerobatics

With the Crackle's light wing loading and wide speed range, most AMA sport pattern aerobatics are possible. Almost anything except unlimited verticals is possible. Aerobatics with the Crackle are just "plane" fun.



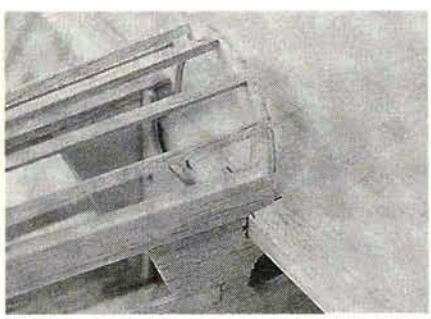
Above: before you build the fuselage, match up the fuselage sides to verify that they are the same size and shape. Below: use tape or rubber bands to hold the fuselage sides together while you get everything lined up over the plans; then glue the parts together.



longerons between the front and rear fuselage sides, you must remove the pieces from the plans and flip them over before you continue. If you don't, you'll end up with two right sides, and that means you'll have to build two Crackles.

Match up the completed left and right fuselage sides, making sure that both sides are the same length and shape. Sand the fuselage sides to even out any differences. Use a sanding block to taper the balsa ¼-inch triangle and the ⅛-inch-square stock at the tail of the fuselage sides. Glue the two ⅛-inch, lite-ply, slotted wing hold-downs together, and taper their lower front edges slightly to allow the wing-hold-down bolts to slide on more easily. Fit into position (do not glue) the motor mount, battery tray, wing hold-down and formers F2, F4 and F6 between the two fuselage sides. Use tape or rubber bands to hold the fuselage sides together while you work. Use the top view of the plans to make sure everything is square and twist free; then glue the fuselage sides together, first at the tail then at F2. Check the alignment as you glue formers F4 and F6, the wing hold-down, the battery tray and the motor mount to the fuselage sides. For added strength, glue ⅛-inch-square balsa strips on both sides of the fuselage behind F2.

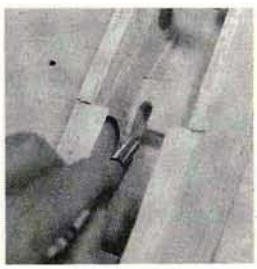
Install the elevator, rudder and antenna pushrod-guide tubes in the fuselage; then sand them flush with the outside of the fuselage. Install a Velcro®-brand battery strap through the slot in the battery tray. Glue F1 into position perpendicular to the wing saddle; then glue F3 and F5 into place. Now cut and glue the five ⅛-inch square turtle-deck stringers from F1 to F6. Sand the stringer ends flush with F1 and F6, then assemble the battery hatch, using the plans as a guide. For strength, glue a piece of ⅛-inch lite-ply to the bottom of the hatch forward lip.



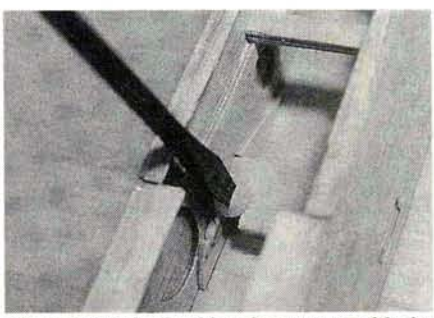
Fit the wing trailing edge in the notch, under the turtle deck, at former F1. You will have to trim the notch for a snug fit over the wing's TE.

WING MOUNTING

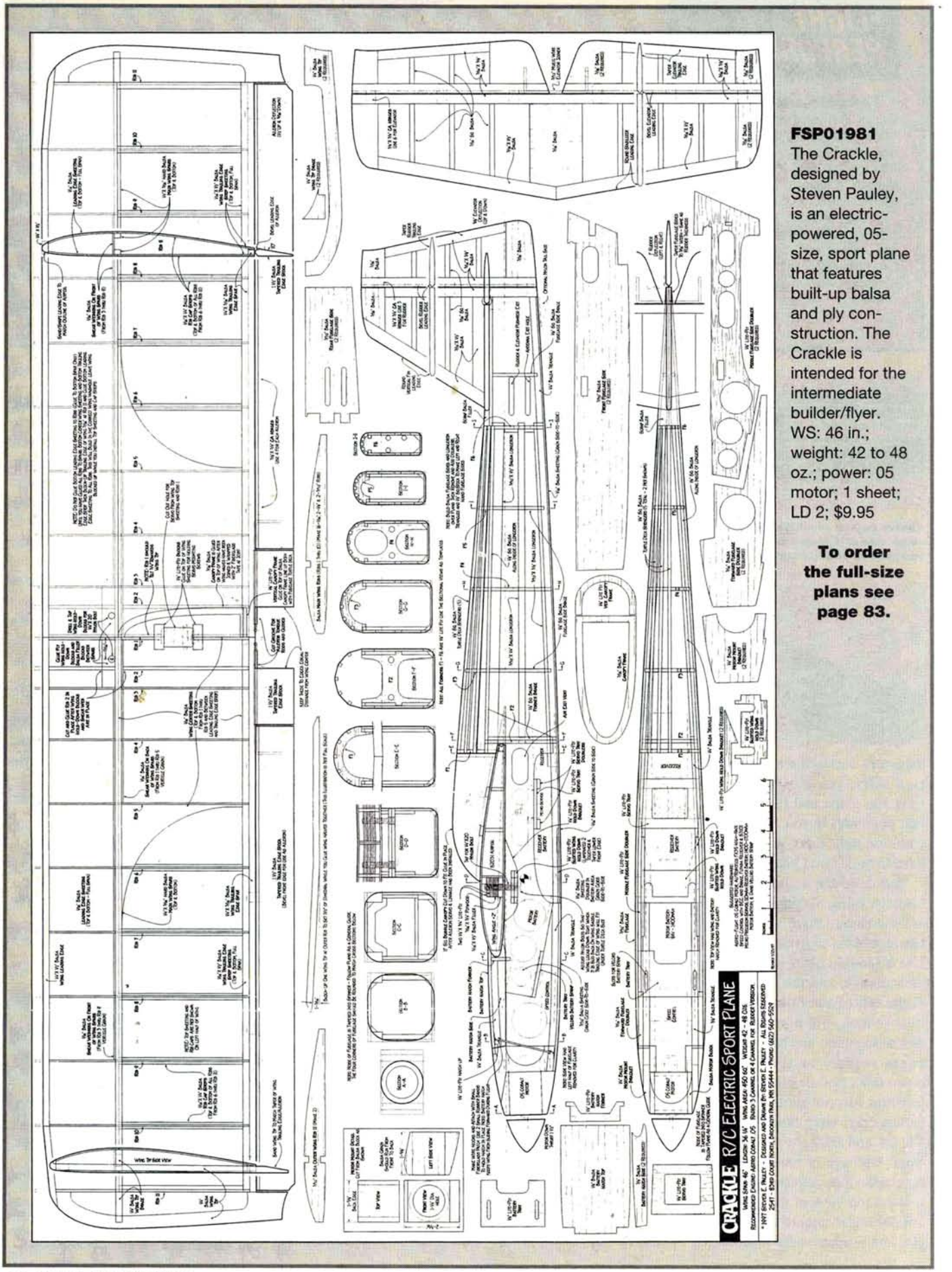
Lay the wing in the fuselage wing-saddle area and, if needed, sand the wing saddle so that the wing sits level. Slide the wing back until the TE fits under the fuselage overhang at location "EE." Trim the notch, or overhang, to allow the wing to slide all the way under it. Take your time and get a good fit here. With the wing all the way back in the notch, measure from the wingtips back to the tail and be sure the wing is perpendicular to the fuselage. Tape or pin the wing into place, then turn the fuselage and wing over. Being careful not to disturb the wing, mark the hold-down slots on its underside. Also, draw lines marking the inside edges of the fuselage sides; these marks are guides for drilling the wing-mounting bolt holes. If you build everything accurately, the holes should go through the plywood wing-hold-down



With the wing in position in the wing saddle, mark the wing-hold-down slot location on the wing's bottom. Use these marks as a guide for drilling the wing-hold-down bolt holes.



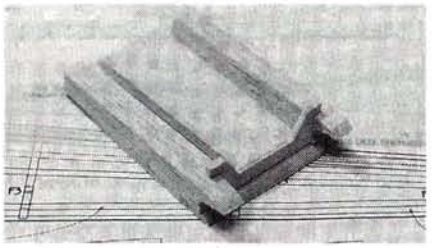
The bolt heads should make contact with the slotted wing hold-down enough to hold the wing securely but not so tight that it makes the wing difficult to slide into position.



FSP01981
The Crackle, designed by Steven Pauley, is an electric-powered, 05-size, sport plane that features built-up balsa and ply construction. The Crackle is intended for the intermediate builder/flyer. WS: 46 in.; weight: 42 to 48 oz.; power: 05 motor; 1 sheet; LD 2; $9.95

To order the full-size plans see page 83.

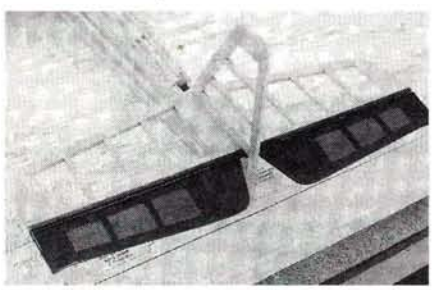
blocks inside the wing, just ahead of the main spar. The wing bolts must be mounted accurately on the wing so that when you slide the wing all the way back in the saddle, the TE will be under the fuselage overhang and the bolts will be all the way back in the slots. Study the plans carefully before you proceed.



This is what the battery hatch should look like after assembly. The lite-ply former is near the rear edge.

Drill and tap the holes for the ¼-20 nylon bolts. Screw the bolts in while you hold the wing in position on the fuselage. With the wing mounted on the fuselage, glue the canopy frame on top of the wing. To keep from gluing the canopy frame to the fuselage, place wax paper between the wing and fuselage turtle deck; then trim and glue the lite-ply vertical canopy frame on top of the wing, flush with the turtle deck. Add balsa scrap braces at the canopy frame joint. Now fit the battery hatch between the wing and the motor mount. You may need to trim the hatch to fit around the wing LE. The hatch fit is important because it prevents the wing from sliding forward.

Before you mount the stabilizer and elevator, cover the LE of the elevator and TE of the stabilizer. Mount the wing on the fuselage and block up the wingtips level on your work surface. Pin the stabilizer into position, and check that the stabilizer is square with the fuselage and level with the wing before you glue it into place. Use six CA hinges (I used SonicTronic* Nifty Hinges cut in half) to hinge the elevator to the stabilizer. Pin the fin into position, and be sure that it is perpendicular to the stabilizer and lined up with the fuselage before you glue it into place.



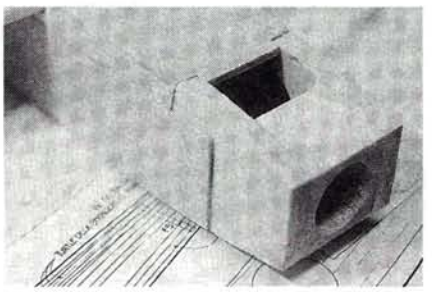
The tail section mounted on the fuselage. Use a scrap of balsa to fill the gap between F6 and the stabilizer.

Use scrap balsa to fill the gap between F6 and the stabilizer.

FINISHING THE FUSELAGE

Sheet the bottom of the fuselage with 3/32-inch balsa below the forward fuselage doubler; use 1/16-inch balsa for the rest of the fuselage. Add the 1/16-inch doubler to the inside bottom of the battery compartment. Glue two small ¼-inch balsa triangle pieces to the inside corners of the motor-mount doubler and the fuselage bottom.

Carve, shape and sand the front of the fuselage to blend it into the spinner. As a guide, you can temporarily mount the motor and spinner into place. Make up two wire hooks as shown; glue one to the fuselage bottom and the other to the underside of the battery hatch. Reinforce the hooks with small pieces of fiberglass cloth. Use two small rubber bands between the hooks to hold the battery hatch in place. Round all fuselage corners, then final-sand the entire airplane.



The front of the fuselage. Note that the battery hatch and motor mount are complete and ready for shaping down to the spinner.

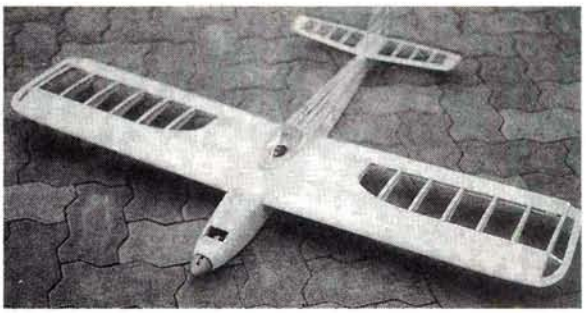
FINAL ASSEMBLY

After you have completed the covering, hinge the rudder to the fin using three CA hinges, and hinge the ailerons to the wing with five hinges each. Install the RX, flight battery and all servos; then connect the rudder and elevator servo linkage and check for correct operation. Control throws are as follows:

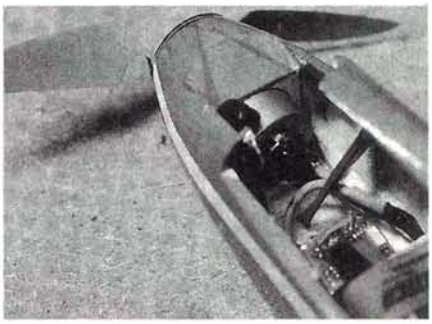
- Elevator—5/8 inch up and down.
- Rudder—1 inch left and right.
- Aileron—up 1/2 inch, down 5/16 inch.

Cut and fit the canopy over the wing and canopy braces. When you are sure that the ailerons are working properly, glue the canopy into place. The aileron servo will be inaccessible, so be sure the ailerons work correctly before you glue on the canopy.

Mount the motor and speed control in the plane; then install a folding prop. Slide the motor battery into place on the tray and secure it with the Velcro® strap. Check the balance of the plane, and adjust the battery until it is correct. Make every effort to balance the plane without adding extra weight.



This is what the Crackle should look like when it's ready to be covered.



Here you see the motor and prop mounted in the nose. The speed control is mounted under the battery tray. In flight, the battery-hatch hold-down hooks and rubber bands will hold the hatch on.

AT THE FIELD

Just to be safe, have someone hand launch the Crackle for you on the first flight. If possible, I like my first flight to be over some tall grass, just in case.

The Crackle has a very wide range of flight characteristics. Its streamlined fuselage and low-drag airfoil allows high speeds and little loss of momentum with the motor off. It can slow to a crawl and thermal like a sailplane. Most aerobatics (loops, rolls, inverteds, stall turns, hammerheads, 1/2 Cuban 8s, Immelmanns, etc.) are possible, including consecutive loops with the motor off. With proper power management, the model is capable of 7 minutes of powered flight on a 7-cell 1400mAh sport pack. The prototype has been flown for 25 minutes by riding thermals and going easy on the throttle. Enjoy!

**Addresses are listed in the Index of Manufacturers on page 158.*

About the Author

A graphic designer from Minneapolis, MN, Steven Pauley has been flying and designing R/C planes since 1989. He enjoys both electric- and glow-powered planes. The Crackle is the seventh plane that he has designed. Steven would love to hear from other Crackle. builders. His address is 2547 83rd Ct. N., Minneapolis, MN 55444; (612) 560-5529.

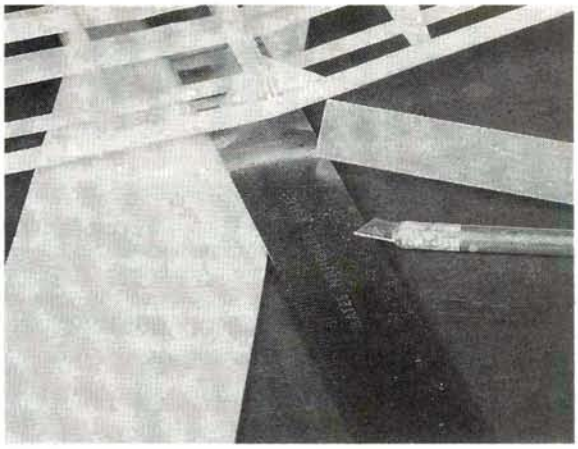
MODEL AIRPLANE NEWS
HOW TO

5 steps to clean wings

Inlay Balsa Sheeting

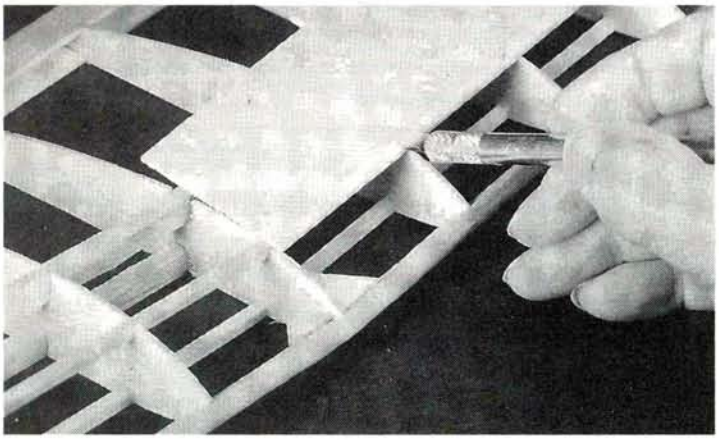
by RANDY RANDOLPH

For the scratch-builder, trimming wing center section ribs to receive the top and bottom sheeting is always a hit-or-miss proposition. Even if the ribs are trimmed before they are mounted onto the spars, it's difficult to get just the right amount of material removed from the top and bottom of those center ribs. A method suggested by Canadian John Hannah solves the problem simply and easily: don't trim the ribs! The photos show the way.

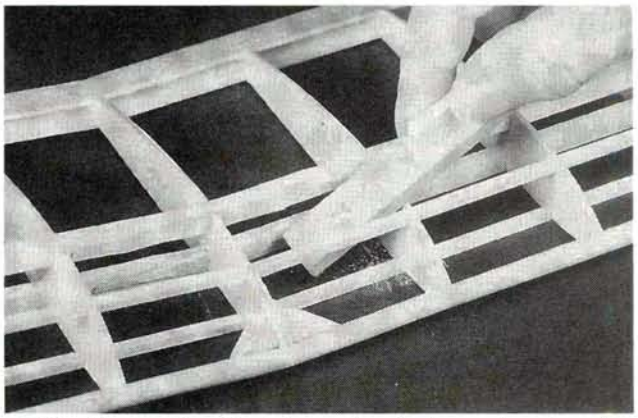


PHOTOS BY RANDY RANDOLPH

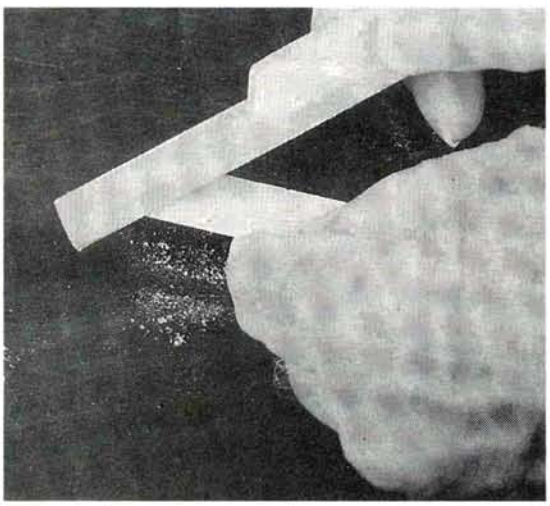
1 Other than the sheet balsa (1/16 inch, in this case), you'll need a metal straightedge to assist in trimming the balsa sheet, a razor knife and a small sanding block. (An emery board works very well.)



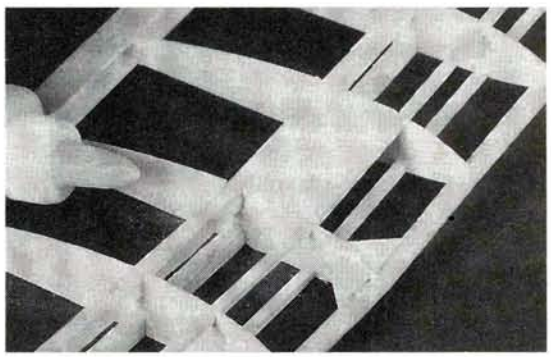
2 Lay the sheet on the area to be sheeted and carefully mark the centers of both ribs on the sheet. A slight cut with the razor knife is an excellent way to mark the sheet. Also, mark the exact width needed (for this piece, the distance between the top spars).



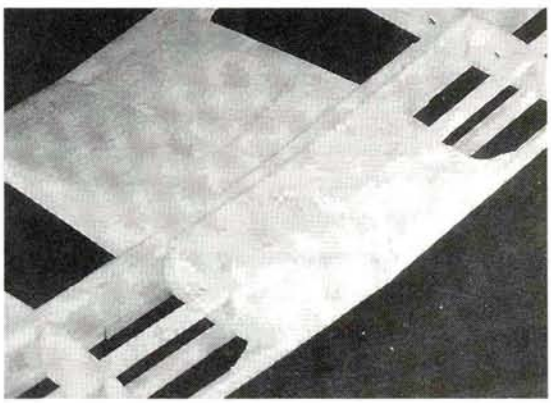
3 Use the sanding block to sand a 45-degree bevel on the insides of both ribs. It isn't absolutely necessary to be exact with the bevel; just try to be as accurate as you can. Sand to the outsides of both ribs; just a few passes are necessary.



4 Now sand the same bevel into the two edges of the sheet. It isn't necessary to sand the sides because they will fit flush with the tips of both spars when the sheet is in the wing.



5 Fit and glue the sheet into place. No additional sanding is usually necessary, and the sheet fits perfectly in place flush with the spars and the tops of both ribs. Aliphatic resin or even Ambroid glue is great for this application and, most of the time, pins aren't needed to hold the piece in place.



6 The rest of the sheeting is added in just the same way. Actually, the glue joints that are formed between the sheet and the ribs are the same as if the ribs had been trimmed to accept the sheet. This system can be used in just about any area where it is necessary to inlay balsa sheet into a finished structure.

MODEL AIRPLANE NEWS
FIELD & BENCH REVIEW

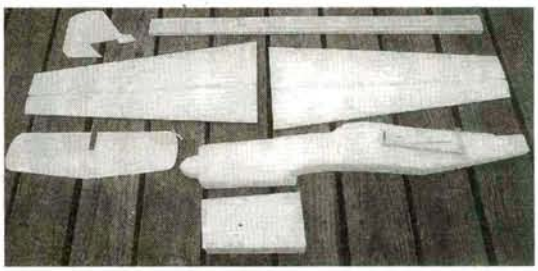
Indestructible Interceptor

IF I TOLD YOU a slope craft exists that provides a worry-free training experience and turns more heads than an Italian sports car, you would call me a liar. Well, I'm not lying, I'm referring to Dave's Aircraft Works* nigh-invulnerable slope warbirds. These planes provide massive amounts of WW II combat madness, and you don't even need to bring a repair kit to the hill. My FoamWulf-190 was easy to build, looks great and flies like a dream.

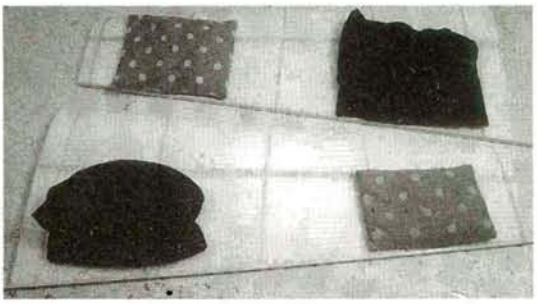
Dave's Aircraft Works FoamWulf-190

by LOU GARWOOD

DAW designer Dave Sanders developed several WW II warbirds for slope combat, both Axis and Allied, that require no repair time. The primary material of construction is EPP (expanded polypropylene) foam. This revolutionary new foam found its original use in the computer-packing industry before its introduction into model aviation in 1996. EPP's characteristics make it ideal for slope flying. Hot wire cuts it well, which allows for the beautiful look of these planes. It's light, which makes the planes fly great, even in light lift. It's resilient, which means you'll be able to smash them into each other, nose-dive them into the ground, wrap them around fence posts and never waste time repairing them.



The kit includes EPP foam wing-cores and fuselage, coroplast fins, and wooden spars, trailing edge, dihedral brace and aileron stock.

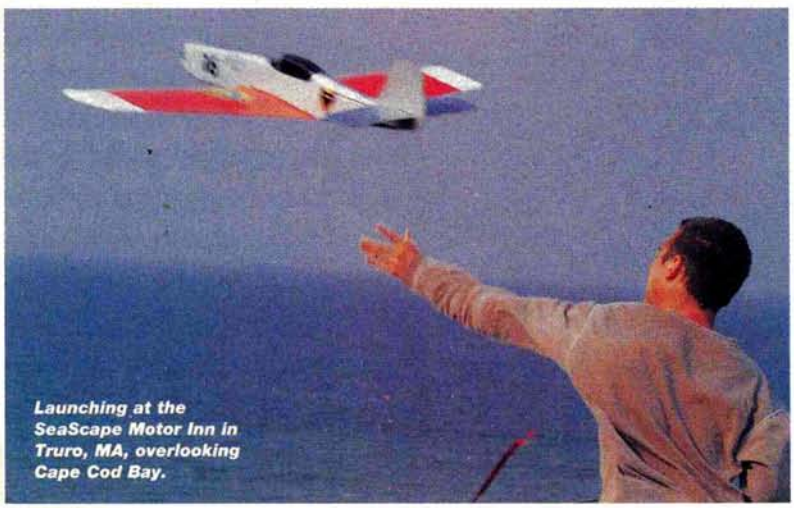


The wing halves after the spars and sub-trailing edges have been glued in place. The sandbags keep the wing straight while the glue cures.

KIT CONTENTS

The kit comes with almost everything you will need to complete your airplane: EPP foam fuselage and wing core, coroplast fin and stabilizer, a scrap piece of foam to fill in the radio cavity, wooden parts that include ¼x½-inch basswood spars and dihedral braces, ⅛x⅜-inch basswood sub-trailing edge pieces and a couple ⅜x2-inch trailing edges. For hardware, you get 3/32-inch aileron torque-rod linkages, 6-inch wire elevator joiner and nylon control horns and screws.

You'll need a tube of silicone sealant (aka Shoe Goo), or you can use hot glue. A small tube will suffice. You'll also need a small amount of epoxy, a bit of 3M 77 spray adhesive and nylon filament strapping tape. You will use about half a roll of 2-inch-wide tape for this project. The final adhesive is about 4 feet of aileron hinge tape.



Launching at the SeaScape Motor Inn in Truro, MA, overlooking Cape Cod Bay.

The last things you will need are two rolls of covering (I used Ultracote* because it is recommended in the instructions), two 24-inch pushrods for the elevator and rudder (rudder is optional, however) and a beat-up old radio that you don't mind leaving in the plane for awhile. You can use full-size servos and receiver.

CONSTRUCTION

The process went quickly (8 hours for construction, 2 hours for covering), and the instructions explained everything clearly and concisely.

I used the silicone sealant to attach the spars and

The plane in a low pass, flying under the radar and anti-aircraft flak.

PHOTOS BY DAVID GARWOOD

SPECIFICATIONS

Name: FoamWulf-190D

Manufacturer: Dave's Aircraft Works

Type: standoff-scale combat slope glider

Wingspan: 48 in.

Wing area: 453 sq. in.

Weight: 31-35 oz.

Wing loading: 9.8 to 11.1 oz./ sq. ft.

Length: 35 in.

Channels req'd: 2 (ailerons and elevator), rudder optional

Radio used: Airtronics with a 92765 receiver and 2 Airtronics 94102 servos

Airfoil: Selig 3406 (semi-symmetrical)

Type of wing construction: all EPP foam with wood spar and sub-trailing edge

Kit construction: EPP foam, coroplast fin and stab

List price: $59.95

Features: quick construction from EPP foam that builds into an exceptionally tough and durable sailplane.

Comments: the kit quality was excellent. The wood was straight and strong, the cores were cut evenly and smoothly. The pieces were packed well, and they sustained no damage during shipping. I was happy to see such fine crafting in a foamy.

Hits

- Builds quickly and easily.
- Flies well in all types of lift.
- Highly maneuverable.
- Durable.

Misses

- Wing is permanently fastened, which makes transport cumbersome.
- Hatches are not provided in the design, so radio repair work requires some refinishing work.

the sub-trailing edges to the wings. While I waited for the glue to cure, I decided on the radio layout. I varied the radio layout slightly from the instruction booklet, and it worked out well. I only had to add approximately 15 grams to the nose to balance the plane.

Now comes the scary part: take your new EPP fuse and carve out cavities for your battery, receiver, elevator servo, all the wiring in between and the elevator pushrod. The components should fit snugly into the fuselage, and when covering the holes with thin pieces of EPP, there needs to be enough clearance space between the radio and the foam. Also check to see that the foam covers, when in place, are flush with the fuselage side. Next, use the silicone sealant to glue the radio gear into the cavities. You might want to cover them with masking tape if you foresee that you'll want to remove them later. This setup is quick and easy, and I experienced no problems with the radio installation.

Next I sanded the wing halves and rounded off the leading edges and made the sub-trailing edges flush with the cores. I chose to do a one-servo setup and followed the appropriate steps. I used epoxy to glue on the fixed (inboard) part of the trailing edge and inserted the aileron torque rods. Then I joined the wing halves using epoxy and the wood provided in the kit. While all this epoxy cured, I took the fuselage and a hobby knife and turned that block of foam into a Focke-Wulf Fw 190. The foam was easier to carve and sand than any other foam I have used. Then I used strapping tape, as directed, to strengthen the wings and fuselage. The tape doesn't stick to the foam very well, so I used 3M spray adhesive to help it stick. The instructions contain a diagram for first-time foam tapers like myself.

I wanted my plane to stick out in a slope furball, so I opted against the military look. I went for the pylon-racer look, with racing numbers on the fuselage and a made-up insignia for the wings and tail. The Ultracote stuck to the foam well and my plane came out looking pretty sleek.

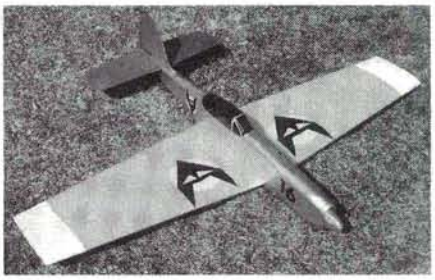
FLIGHT PERFORMANCE

• Launch and landing
Launching is easy: just toss it into the wind off the slope. Finding a secure grip is tricky because of the low wing. Landing is no problem because the plane is very rugged—just put it into any nearby bush, or catch it.

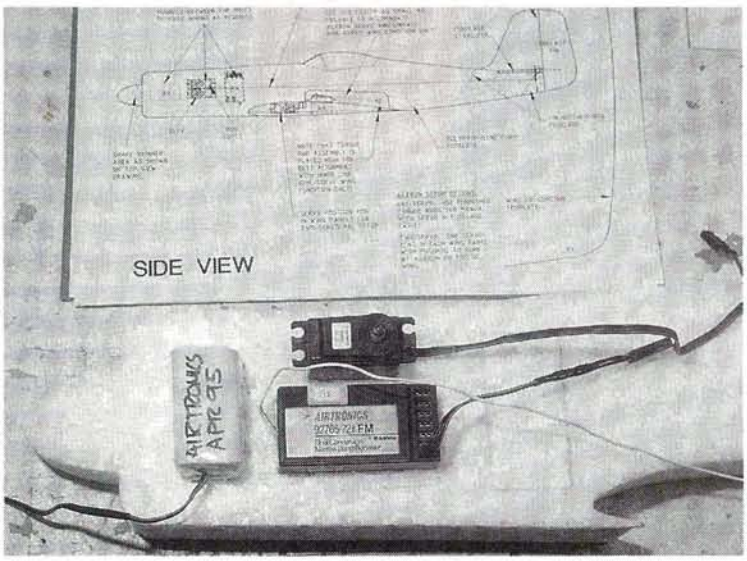
• High-speed performance
This plane is not particularly fast for a small slope soarer, but at its top speed, it's stable and responsive.

• Low-speed performance
When the 190 is slowed down, it's a bit sluggish and mushy on the controls. You have to keep the nose down to fly it well.

• Aerobatics
It has a quick roll rate, about 720 degrees per second, and with enough wind, it can roll directly from level flight. Loops require some aileron work to keep the loop tracking straight. The FoamWulf needs substantial forward stick to hold inverted flight, and it recovers quickly from collisions and botched maneuvers.

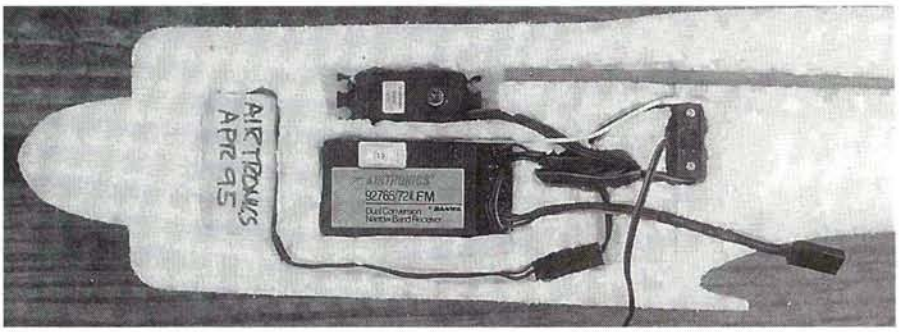


Picture of the completed FoamWulf taken about 15 seconds before its first flight.



Right: my final radio placement as compared to the one in the plans. My modification was to move the weight forward.

Below: the radio gear test-fitted into place. Make sure that all the gear is embedded within the plane or the side of your fuselage will be bumpy.



CONCLUSION

I had no problems with the FoamWulf. The kit had quality materials. The plane builds quickly and easily and uses new techniques that spice up the building process. It's durable, it's great to learn with and great to combat with. It's maneuverable, yet stable; it's easy to fly, yet not limited in what it can and will do. I had fun flying it by myself, practicing smooth maneuvers and passes, and I had fun flying combat and formations with Dave Sanders and my Dad. I recommend this kit to people looking to get into slope flying and to experts looking for a fully functional and great-looking addition to their fleet.

**Addresses are listed alphabetically in the Index of Manufacturers on page 158.*

MODEL AIRPLANE NEWS

PRODUCT REVIEW

Expose this side to cooling air, if possible. Note programming button in upper left-hand corner. Push this button with the end of a small screwdriver, not your finger.

Aveox

L60 uP Hybridrive Brushless Motor Speed Controller

by TOM HUNT

The future of speed controls

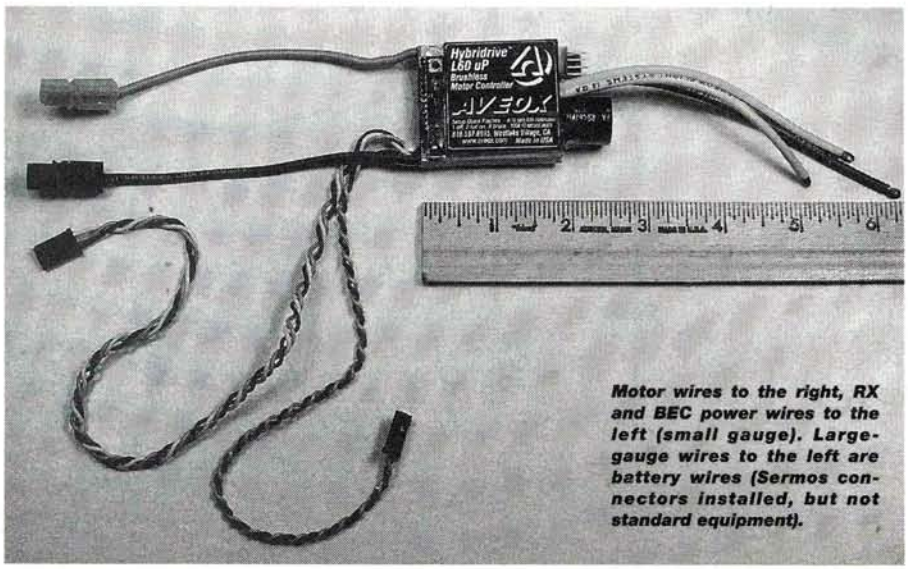
As they used to say, "A television set is only as good as the antenna attached to it." Likewise, a brushless motor is only as good as its speed controller.

I have been involved in using, testing and competing with Aveox* brushless motor systems since their introduction to the sport of model aviation in the early 1990s. Their motors have not really changed that much over the years. The speed controllers, those wonders of electronic wizardry that convert the output of a DC Ni-Cd battery into 3-phase AC current to power the motor, *have* come a long way.

Early Aveox speed controllers (LV120/HV120) were expensive, bulky, heavy and required manual setup to each different model/radio. Once properly set up, these controllers worked fine and, in combination with the brushless motor, produced exceptional flight performance over a similar brush motor system. Then, the electric modeling community said, "Make it smaller! Make it lighter! Make it *cheaper?*" Aveox dived into the task.

In 1995, Aveox came out with the next generation electronic speed controller (F5LV, F5MV, F5HV) for their motors. It *was* smaller, it *was* lighter and a little bit cheaper. It did suffer, however, from poor throttle response with respect to stick position. Much of the throttle-stick position was wasted, and precise control of the rpm of the motor was elusive. Many of these controllers found their way into my sprint event, self-launched sailplanes, where they are used basically as on/off switches. Until recently, one of these second generation controllers, an F5HV, was flying my 1/7-scale Pica* Spitfire. I found it quite difficult, once in the air, to find the right throttle position for long cruise flights.

As they say, "The third time is the charm," and for Aveox that seems to be true. The new third generation ESCs are smaller and lighter still, but they now have a microprocessor to set the throttle response from the transmitter stick at any position the modeler desires; more about that later. Four new controllers are offered: L30, L60, M60 and H60. "L" stands for low voltage (6 to 16 cells), "M" for medium voltage (8 to 21 cells) and "H" for high voltage (14 to 32 cells). The number after the letter is the maximum current allowable. The L30, L60, and M60 controllers now also have a BEC (Battery Eliminator Circuit). Why? Because modelers asked for it. It can be enabled on these controllers when using 10 cells or less. This feature, because of the intended higher cell count, is not available on the H60 controller.



Motor wires to the right, RX and BEC power wires to the left (small gauge). Large-gauge wires to the left are battery wires (Sermos connectors installed, but not standard equipment).

PHOTOS BY TOM HUNT

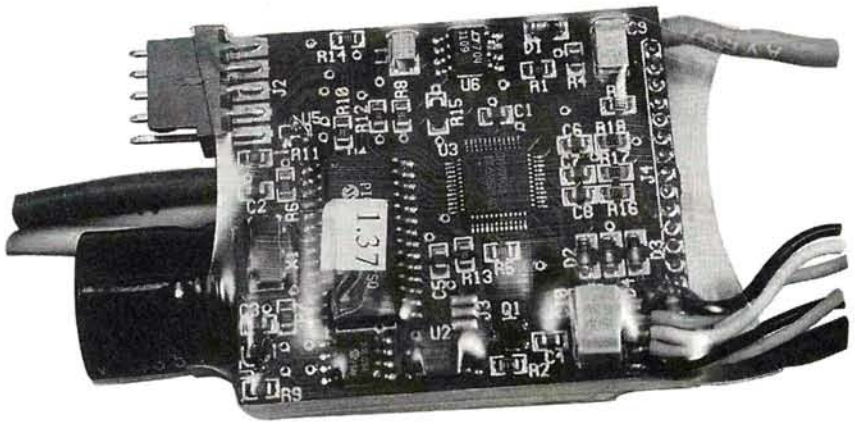
FEATURES

The L60 controller, reviewed in this article, has all the same features as the other new models. It also has the latest software release burned into the microprocessor—Version 1.37. The first feature I find very useful is the ability to program where the motor will start or stop and have the brake applied (if used). The instructions provided with the unit are clear so I won't go into detail. All the modeler needs to do is push a small button on the controller when the transmitter stick is positioned at low throttle (I use low-throttle stick position and high-throttle trim position). Push it again when the stick is advanced to high position, and once again for the brake position (I use low throttle/low trim for brake). These programming steps are stored in non-volatile memory so that you do not need to reprogram whenever the power is turned off or the battery is removed. Another nice feature is that the throttle response is reverse exponential: you get more throttle response at the low end and less response at the high end. This now allows you to taxi a model without having to move the stick past half-throttle.

When using 10 cells or less (and no more than three microservos), you may opt to use the BEC function. There are no wires to snip, no switches to throw. You just install the 2-wire (black and red) connector on a standard radio switch and the switch harness on the battery slot on the RX. Plug the 3-wire (red/black/white) connector directly into the throttle channel slot in the RX. If BEC is not desired, do nothing with the 2-wire connector and plug a4-cell pack into the switch harness/RX. When BEC is not used, the ESC is optically isolated, which means that errant signals cannot travel from the ESC into the RX—possibly causing glitches. I have been using this unit in the BEC mode and have not found "noise" to be a problem.

An auto cutoff feature is also installed. This shuts down the motor when the motor pack reaches half its installed no-load voltage. A 7-cell pack usually comes off the charger at 10.5 volts (no load). The motor will shut down when it reaches 5.25 volts. A fail-safe feature shuts the motor down whenever the pack drops below 4.5 volts.

The controller will not start the motor if it does not receive a signal at or below the motor off point. The controller is also temperature-protected. Soft-brake, proportional-brake and no-brake options are available, depending on how the controller is programmed by the modeler. If you want to use a spur-and-pinion gearbox, the controller is also reversible. This is done by holding down the programming button momentarily



This is the side you mount on the model with hook-and-loop-type fasteners. Note the absence of potentiometers to adjust! Motor-rotor position-sensor connector block is in the upper left-hand corner above the capacitor.

SPECIFICATIONS

Name: Hybridrive L60 uP Brushless Motor Controller

Manufacturer: Aveox Inc.

Number of cells: 6 to 16

Maximum current: 60 amps

On resistance: .006 ohm

BEC: yes (can be disabled), maximum 10-cell use.

Brake: yes (can be disabled)

Optocoupling: yes (when not using BEC)

Dimensions: 1.75 x1.50x.35 in. (without capacitor)

Weight: 2 oz. (with no connectors and 2 in. of lead wire.)

Switching frequency: 8000Hz

Price: $199.95

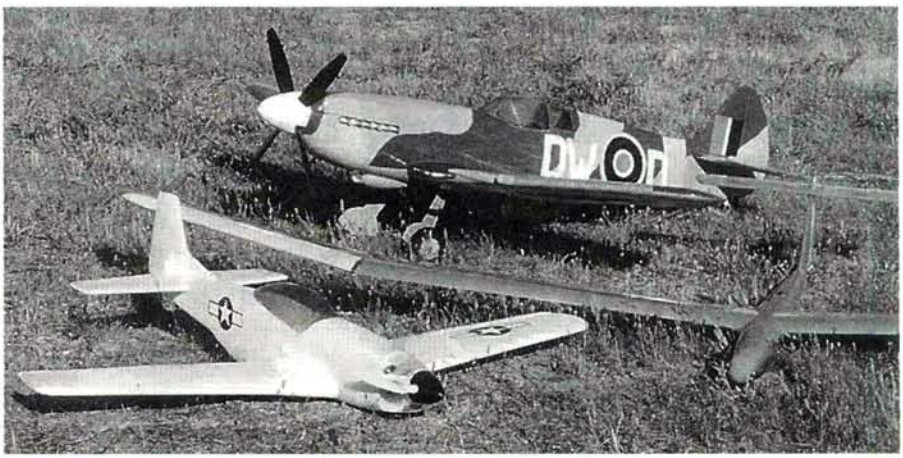
Features: latest software release burned into the microprocessor—Version 1.37; the ability to "program" where the motor will start, stop and have the brake applied; clear instructions; "non-volatile" memory, so one does not need to reprogram when the power is turned off or the battery is removed; "reverse exponential"—you get more throttle response at the low end and less response at the high end; BEC function is optional; ESC is optically isolated; auto cut-off feature; the controller is temperature protected; soft-brake, proportional-brake or no-brake options; the controller is also reversible.

Hits

- High quality of manufacture.
- Many user friendly features.
- Precise throttle control.

Misses

- None; well, can you make it smaller still?



Three aircraft sporting the L60 uP or the H60 uP controller: the MEC (Kyosho) foam Mustang with the 1406-4Y motor (direct drive), my Defiant class A/B sailplane with the F7LMR motor/gearbox and the L60 uP controller, and my Pica 65-inch Spitfire with a Modelair-Tech H-1000 belt drive at 3.27/1, a 1412-4Y motor and the H60 uP controller on 24 cells.

while plugging in the battery pack, but do not hold down the button too long or you will disable the auto-cutoff feature.

TESTING BY FIRE

The only meaningful test I could perform on this speed controller was to fly it! I have three aircraft models that have flown before, with and without brushless motors, and I know what to expect from them.

The first model is an all-foam Mustang by Kyosho, marketed through Model Electronics*. It is a sport-scale model for use with from 7 to 10 cells and is a sweet flying model—no bad habits. For this model I used a 1406-4Y as supplied by Aveox on direct drive. Ten 1000mAh cells powered the model with a 9.5x5 Aeronaut* folding propeller. The model with the Aveox power system weighs 45 ounces. Current draw is about 30 amps at full throttle.

The Aveox motor/ESC system was installed with no trouble; there is plenty of room in this model. The controller was programmed to respond to my Futaba* Super 7 FM transmitter and Hitec* 535 RX. Two Futaba S-133 servos control ailerons and elevator. I chose the BEC option, to keep the weight low. Flight performance is quite sprightly. The model really moves out at full throttle. The speed controller worked flawlessly through many test flights. I exercised the brake many times and cruised the model at many different throttle settings. This speed controller, at least in the air, really shows off its reverse exponential response, as acceleration to full speed is nearly instantaneous. Four- to 5-minute leisurely flights with a few full-power aerobatic maneuvers are typical.

The second model, my larger, sport-scale Pica Spitfire, is powered by a 1412-4Y on a Modelair-Tech* 3.4/1 belt drive. This combination swings a homemade 4-blade 16x10 prop for around 27 amps. Twenty-four 1700mAh cells power this fine flying scale model that weighs 10 pounds. Previously flown with the early Aveox controllers, the model flew typically for 4 to 5 minutes. Power was typically reduced after gear retraction and climb-out, but finding a good cruise position was difficult. After installation of the new H60 controller, flight times with the same battery pack increased to well over 6 minutes. I attribute this gain to the ability to control rpm more precisely with this new ESC.

The last model, my Defiant class A/B sailplane, has an Aveox F7LMR motor for use in the sprint sailplane events. Although this controller only "sees" a full/on and brake/off condition, I wanted to subject the L60 to the high current required to be competitive in these events. The controller was subjected to currents near capacity (60 amps) for 45 seconds on half a dozen flights with no over-temperature shutdown. No cooling air is available in this model, although Aveox recommends it. The soft brake is really just that. Earlier Aveox controllers, with the brake enabled, would rattle the teeth right out of your mouth!

CONCLUSIONS

These new speed controllers by Aveox surely are a step forward in features and performance. Small size and light weight make them easy to install in all but the smallest models. Precise throttle control translates into longer flights. The set-it-and-forget-it nature of the motor and controller makes for a very low-maintenance and less worrisome electric power system. Can this speed controller be improved still? Possibly, but do you really need it to talk back to you?

**Addresses are listed alphabetically in the Index of Manufacturers on page 158.* ✚

Scale TECHNIQUES

by Greg Hahn

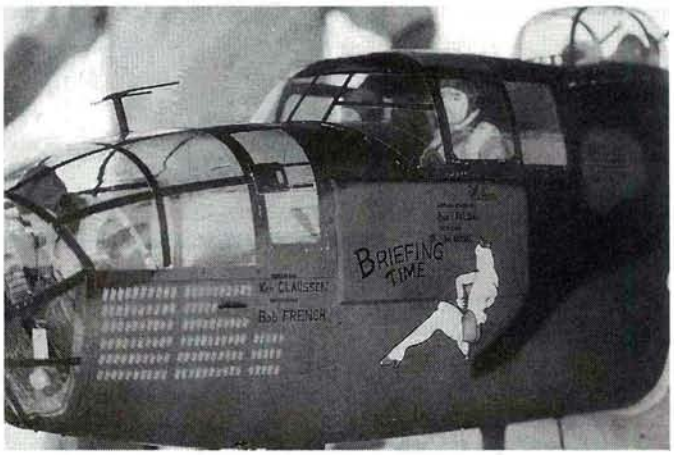
Editor's note: Greg Hahn is from Louisville, IN, and has been flying R/C since 1975. Greg has been in scale competition for three years and has done very well at such events as Top Gun, the Scale Masters and the AMA Scale Nationals. We're pleased to have Greg writing in the "Scale Techniques" column.

SO YOU WANT TO BUILD IT BIG!

I'M OFTEN asked for information about blowing up plans. I guess my big competition B-25J Mitchell "Briefing Time," which I built from enlarged plans of Nick Ziroli's 101-inch Mitchell, worked well enough to raise some interest. I'll usually reply with two questions: what type of model and how big? Before you get all excited about enlarging a favorite model, you must first consider the realities of the size you desire and the new logistics involved.

Designers don't just flip a coin to arrive at a size for a model. They draw a set of plans to a certain size for a reason—usually because of things such as complexity, structural integrity, or the ability for the model to be broken down for transportation purposes. Do realize that the reasons why the plans weren't drawn larger in the first place will grow in the same proportion as the enlargement.

The logistics of building a model bigger can become quite a headache if not thoroughly thought out before you begin. Is your building shop large enough to handle a plane of this size? An 8-foot span can be quite cumbersome; anything over that, look out! When the fuselage and wing have to be joined together for the incidence check or tail-group mounting, space can become a big problem. Can you get the model out of your shop after it's finished without using a chainsaw? When a model's weight gets up over 35 to 40 pounds, it's usually too awkward to safely carry by yourself. Is someone close by to help? Getting it into a vehicle on your own can be a nightmare, if not impossible. Door jambs and elevators have a mysterious "magnetic" attraction. The biggest aggravation I have with my big Mitchell is the fact that I can't do anything with it by myself. I practically need help just to look at it! Static judging alone is a three-man job.



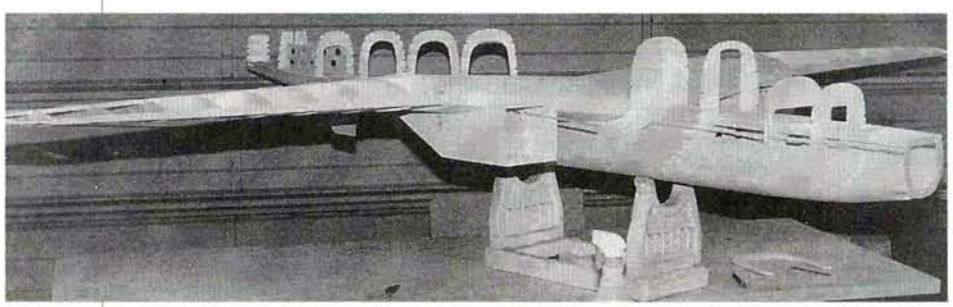
Big does have its advantages —lots of room for radio equipment and super-detailed interiors.

MOVIN' IT

Will it fit into your vehicle? Anything over 8 feet long won't fit into a pickup truck, so a trailer may be in order. Actually, a trailer is really quite handy but can also become an added expense. As you can see, there are many things to consider before you even open the glue bottle or head out to the copy shop. I just don't want you to be faced with a "big" disappointment.

If you're still with me, then you've made it through the early weeding out process, and we can get down to the next step. Making a decision on just how much to enlarge the plans requires you to consider a lot of things all at once. Expense and legality are the two considerations that are most important to me.

When you enlarge a plan, most if not all of the hardware pieces, such as landing gear, cowls, canopies and other bumps and appendages, are not available. You either have to make them yourself or pay to have them made and, believe me, low-volume mold-making can be quite expensive. If the plane you're building happens to have retractable landing gear, these also will need to be custom made. Of course, increasing size does increase cost, but the hardware factor may compound the cost more than you might have thought.



Enlarging models can also make it difficult to work in your building shop! Here is a shot of my enlarged Mitchell shown in early frame-up with fuse and wing attached. It's in front of a 15-foot-wide garage door; not much room to spare!

IS IT LEGAL?

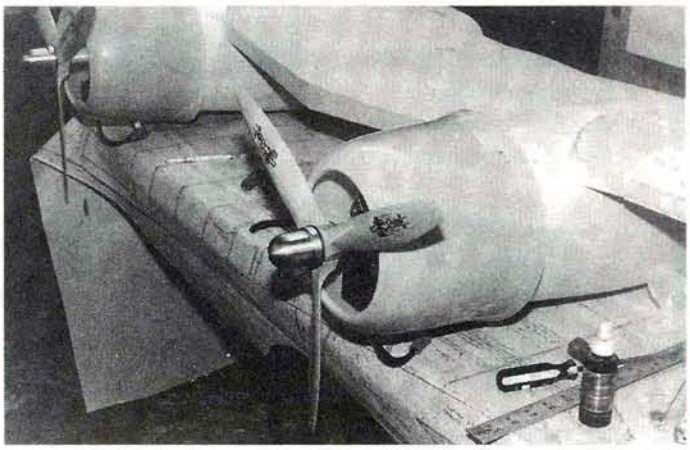
When I talk about legality, I'm talking about weight. Under AMA rules, the limit for competition or sport flying is 55 pounds; there are no dimensional limitations. Personally, if I'm going to go through all the time, trouble and expense of enlarging a plan and building a model, you can bet it will be legal for competition. If the plan you're looking at is for a model that weighs 40 pounds, you'd better leave

it alone unless you want it to be in the AMA Experimental class.

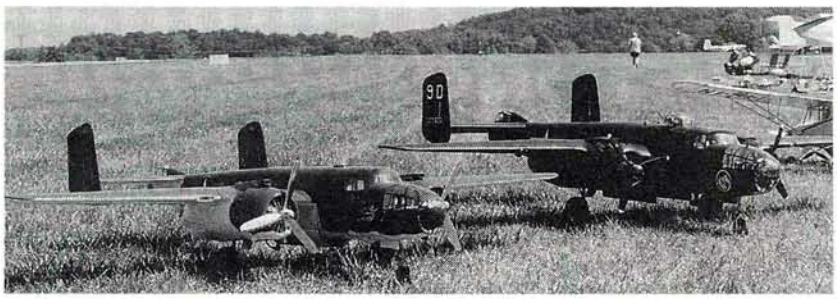
If you have considered all that I've said, then I believe you are ready to "blow one up." The rest isn't too difficult as long as you've had some success in scratch-building.

SIZING THINGS UP

Getting the paper plan enlarged will take some mathematical figuring on your part. When you go to the print shop, they will want to know by what percentage you want the plans enlarged. You can't just walk in and say, "I want to enlarge the span from 101 inches to 118 inches." You'll have to say you want to enlarge the plan 17.5 percent. The wingspan is the easiest dimension to use when figuring out the percentage. Everything else grows proportionally, including the lines in the drawings. Since the lines are so much bigger, you'll have to decide to which side of the line you'll cut your parts. Also, the plan itself will have to be physically cut down in width. Since most plans are printed on 36-inch-wide paper, you'll have to cut and scrunch the drawing together so that when enlarged, it will still fit on 36-inch-wide paper.



Homemade propellers, spinners and custom-made fiberglass cowls; blowing up plans can be quite challenging, even for the seasoned scratch-builder.



Here you can see my enlarged B-25 (118-inch span) relative to the standard (101-inch-span) Ziroli Mitchell.

Once you have your big plans in hand, you'll need to study them carefully and make some wood-size decisions. The wood or lumber dimensions that were originally called for by the designer have grown along with everything else. Usually, you won't find these new sizes and shapes down at the ole' hobby hut. When figuring out new wood sizes, I usually revert to the original sizes for non-load-bearing stringers, formers, and ribs (most profile pieces). Then, on load-bearing items like spars, landing gear-mount blocks and engine mounts, I bump them up 1/8 inch on both sides.

There's no need to use anything over 1/8 inch thick for planking to cover a model weighing less than 55 pounds; 1/8-inch balsa has plenty of strength, especially when 1-ounce fiberglass cloth is applied over it. The only other structural areas to be concerned with are the wing mounts. The mount blocks for the wing bolts in both the wing and fuselage should be beefed up. When I use plug-in aluminum wing tubes, I increase them by 1/4 inch in outside diameter.

CUSTOM HARDWARE

The hardware pieces and parts are going to be the toughest hill to climb in this project. Whether you attempt to build them yourself or have them custom made, good planning will keep stress to a minimum. If you're buying them, get your order in early; you can't expect custom anything to be on your doorstep in a couple of weeks.

The only place I go for retractable landing gear is Robart.* They can make custom gear to your specifications and will even help you with the engineering if you run into a kink. For "scale looks," strength, and ease of operation, they are, without a doubt, the very best! When it comes to mold-making and vacuum-forming, I go to Nick Ziroli Jr. His company, Nick Ziroli Plans*, makes canopies and cowls for their plans, and on occasion, Nick makes custom parts. You do need to make the plug, usually from hardwood or aluminum.

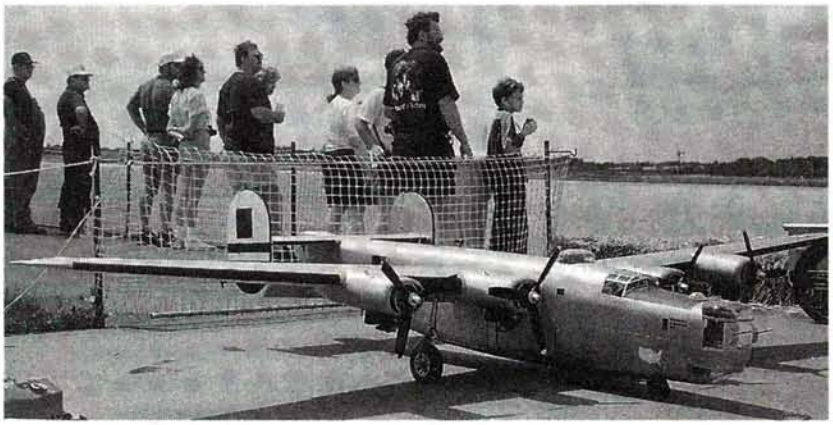
If you need parts that require more strength, like large cowls, then fiberglass is the only way to go. Lenny Stanko of Take Flight Model & Mold*, is called "Mister Smooooth" in the glass business, and I get my glass from him. He can be hard to catch, however, so keep trying if you don't get an answer.

Radio gear will also need more attention. To give you an idea, my B-25, "Briefing Time," uses 19 servos of various sizes and power output, all connected with over 125 feet of wire. Also included are six Y-harnesses and three switch units. I power this mess

One of the Indiana boys, Don Albright, built this 14-foot-span B-17. It is a major-league blow-up of the rubber-powered Guillows kit; powered by four Q 42s, it weighs in somewhere around 80 pounds. The big drawback to a plane this size is the limited flight time allowed because it's considered "experimental" by the AMA.

with two 2500mAh Ni-Cd packs. Servo leads are quite long in the wings, so I strongly recommend the use of larger diameter wire for aileron and flap servos. I also recommend using a servo on each control surface. This seems to spread out control pressure and keep the rod lengths as short as possible.

Another question I'm often asked is whether or not I use "chokes" on the longer leads to suppress noise. A couple of years ago, I converted to JR* radios. At the time, Team JR manager, Mike Stokes, told me that the "chokes" that came on factory servo extensions and "Y" harnesses were a precautionary measure. They have since found them to be unnecessary. So to answer the question: no, I don't use them.



Ron Goodritch (another of the Indy boys) built this B-24 Liberator. It has the same amount of enlargement and same power as Don's B-17. Both models are great flyers!

POWER AND WEIGHT

Power requirements for your larger bird are almost a given. Unless it's going to turn more than two propellers, gasoline engines are the only offerings that produce enough power to get your 40- to 50-pound plane off the ground. Since I love simplicity and reliability, I use Zenoah* 2-stroke, gas engines. They use simple but ultra-reliable ignition systems, are well-balanced and produce minimal vibration for their size and displacement.

Normal building techniques will work just fine, and you shouldn't need any special adhesives; the regular stuff will do. Weight and balance should never be a problem as size goes up. Even though the plane has grown in size, it's still built from the same materials, and the parts count usually doesn't go up; physical weight doesn't seem to grow proportionally. Since the wing area increases, more weight is needed to keep the model from becoming a "floater." I learned this the hard way by trying to keep my 140-inch-span Ziroli C-17 under 35 pounds. I did accomplish this goal, but I ended up with a plane with so much wing area and such a low stall speed that it was virtually uncontrollable in a crosswind. To make a long story short, as the size goes up, the weight should, too!

FLYING BIG

The standard size Ziroli B-25 flew and handled great and is truly a viceless twin. But in choppy air, it seemed to get bounced around quite a bit and looked too fast. For me, the only way to solve these shortcomings was to increase its size. With a 118-inch span, the plane looks slower, and the increased weight softens and smooths out the ride. With the enlargement, crosswind handling during takeoffs and landings improved; the CG range became wider; the reaction time to control inputs slowed and made the plane seem to be flying "heavy." And, of course, the "wow" factor was greatly increased.

I'm a firm believer in building models as large as possible because everything is so much easier to see and control. If your budget, transportation and scratch-building techniques are up to snuff, and you truly have the desire for a one-of-a-kind model, then bigger is the way to go—especially for competition.

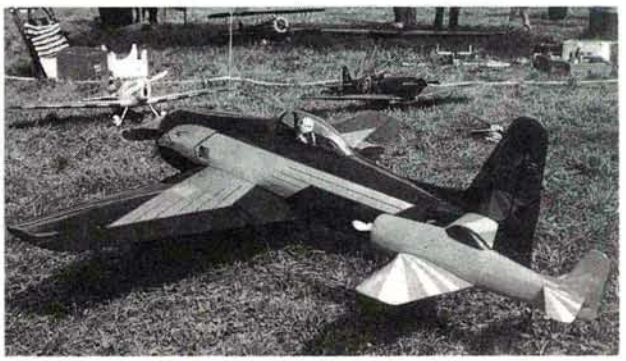
If you've got something new you'd like to share or have a question, drop me a line. My new email address is >ghahn@comsys.net<. See you at briefing!

**Addresses are listed alphabetically in the Index of Manufacturers on page 158.*

Current Thoughts

by LARRY MARSHALL

ELECTRICS ARE DIFFERENT



Electric power systems work in just about any model. Here, the stabilizer of Keith Shaw's 15-pound, 84-inch wingspan Bearcat supports his smaller 31-inch wingspan Bear "kitty." The large model is powered by an Astro FAI60 and belt drive, while the smaller one flies with a geared Astro 020 brushless motor. Both are capable of vertical rolls.

Over the last couple years, the view of electric flight has changed. For the first few years that I was flying electrics, the most common question I received from glow flyers was, "Why would you want to fly electric airplanes?" More recently, however, I am asked, "How do you fly electric airplanes?" I attribute much of this change to the fact that more and more well-designed, good flying, properly powered electric airplanes are showing up at flying fields. This, in turn, is because it's far easier to produce such aircraft with the equipment we now have available to us.

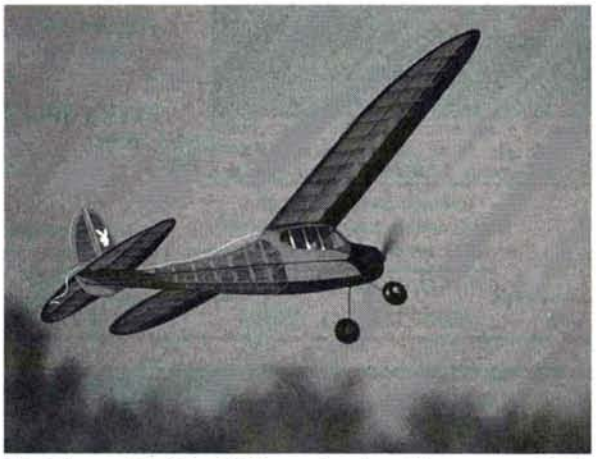
Because of this change, more and more guys flying glow planes want to know what it takes to get into flying electrics. Each has his reasons. Some just like the idea of a new challenge. Some are being caught up in the Speed 400 (small electric airplanes) craze that is sweeping the country. Others like the idea of clean and quiet airplanes that can be flown just about anywhere without upsetting the neighbors, while still others understand that electrics provide other appealing attributes. They are jazzed by the absolute reliability of electric motors that allow one to fly low and close without fearing engine failure, and they really like the idea of finishing models without worrying about fuelproofing. Whatever their reasons, the interest is there and questions abound. But since electrics flyers are still a minority, it's often difficult to get answers to those questions from the local club membership.

Because of this, we've decided to re-establish a column dedicated to electric flight. Every other month, we'll discuss electrics topics: new and useful products and old, well-established modeling techniques as they apply to electric model construction. While I'm going to start doing the talking, I'd like this to be an interactive column, so please let me know your thoughts. Photos and information about your electric planes would be very much appreciated. Most importantly, I'd like to hear your questions, as they can guide where I go with the column. If I can't answer them, I have friends smarter than I who can.

Multi-engine electrics are very popular because of the reliability of the power systems. Here, Dave Baron is on approach to the Queen Valley Airport with his B-17, powered by 32 cells and 4 Astro-geared Cobalt 05s.

I'd like to give you a bit of my philosophy of electric flight. First, electric flight is not the "be all and end all" of powering models. While you can power virtually any type of aircraft with electric motors, there are situations where glow or gas engines may be preferable. Electric flight is different. Electric flight is challenging. But it is not a panacea; it is not for everyone, and it's not "best" unless it suits your purposes. The advantages of electric flight made it my personal preference, but I still fly glow and gas planes occasionally and enjoy them very much.

Electrics flyers tend to mathematically run themselves around in circles trying to find the best power system for this or that plane. To an extent this is necessary to properly match an electric power system to an aircraft. Most will tell you that this is fun (and I agree). But I feel these in-depth analyses tend to turn off newcomers who don't want to spend their hobby time with a calculator in their hand. My view is that if the math becomes so complicated you can't do the arithmetic in your head while driving to work, then you've gone beyond need and most times beyond your ability to predict all the required variables. Newcomers to electric flight can simply use power systems that have been shown to work effectively in the airframe they want to fly. So, for those of you who will nitpick my basic explanations, I warn you that my goal is to keep it simple. Admittedly, this approach will oversimplify and I apologize to experienced electrics flyers in advance, but I think electrics should be easy. It can be, and it doesn't require a math degree to have fun.



Electrics are ideal for old-timers; there's nothing more majestic than these elegant birds circling overhead.

SO WHAT'S DIFFERENT ABOUT ELECTRICS?

With any power system, we find differences from what we're used to. Gas engines are typically much heavier than their equivalent glow engines. Gasoline has a much higher energy/weight ratio than does glow fuel, so it provides much better fuel consumption numbers. On the other hand, a methanol-burning engine will generally put more power to the prop than the same engine set up to burn gasoline. Ignition differs between typical glow and gas engines and this generates unique features and idiosyncrasies that you must take into account. Vibration and fuel effects result in differences in how gas and methanol models are constructed. Modelers who use these power systems know these differences and deal with them without major problems.

Clean and Quiet

So it is with electric systems. Most literature emphasizes that electric power systems are cleaner and quieter than gas or glow systems and, under most circumstances, this is certainly true. There is no need for fuelproofing electric models and, since they don't suffer from vibration and fuel-soaking, they tend to last much longer and stay in good shape after many, many flights.

Reliability

Those who have been using electrics for a while have reliability high on their list of differences that cause them to prefer flying electrics. I feel this is the most important feature of electric motor systems. I think, however, that good gas engines come very close to matching this reliability, although their use is restricted to larger models. The reliability of electric models is manifest in two areas. First, those flying aerobatics or scale airplanes feel very confident flying maneuvers close to the ground and in close succession as the fear of an engine-out condition is nonexistent. This same confidence causes multi-engine aircraft to be popular in electrics circles.

These "clean, quiet, and reliability" differences between electrics and other models have been stated elsewhere but they don't paint the entire picture. We'll talk later about construction of electrics and how they are different because of their clean and vibration-free attributes, but other differences also need to be recognized and understood.

Ducted fan models are becoming popular electrics subjects. Here, Gordon Tarling holds his F-86 just prior to flight at KRC. This plane has the Wemotec fan and an Astro 020 brushless motor for power.

More Power Is Not Better

The old adage "bigger engines are better; you can always throttle back," doesn't translate well to electric flight because the power produced by a particular electric power system is very closely related to its weight. This is not the case for glow engines, where moving from a .40 to a .90 may add only a few ounces to the total aircraft weight yet change power output considerably. For this reason, electrics flyers must be more aware of their power system choices than glow flyers. Couple this with the fact that most high performance electrics must be "developed," either by original design or by conversion of a glow kit, and matching power systems to airframes will seem like a formidable task to a newcomer.

Flight Time

When flying electrics, we must be more aware of the flight time, as we typically want to fly to the limit of our battery "fuel tank." Most folks flying glow planes believe they are flying 10 to 15 minutes per flight, but I've stood beside enough flyers and timed enough flights to know that typical flight times are more in the 5- to 7-minute range. Exceptions are slow-flying, easy-going planes where pilots can deal with longer flying times before their adrenaline runs out, and they feel compelled to land. And so it goes with electrics, as similar times can be had from proper power systems. The difference here is that most glow planes land with half a tank of fuel, whereas electrics can gain these flight times only by landing with nearly empty "fuel tanks."

Motor Flexibility & Prop Selection

Another more subtle difference between electric power and other forms of power is that electric motors are far more flexible in use. This will at first frustrate someone trying to understand them, but later it will become a most cherished attribute. For

instance, I fly a 44-inch wingspan, 3-pound model using a Cobalt 15 spinning a 7x6 prop. I also fly a 5-pound, 60-inch wingspan high-drag model with the same motor spinning a 12x8 prop. With proper gearing, this same motor is capable of efficiently spinning 14- to 15-inch propellers.

Typically, electrics flyers take advantage of two basic tenets of propellers: larger diameters and lower rpm yield better propeller efficiency. So, for a particular airplane, an electric power system will sport a larger prop than its glow counterpart and will spin it somewhat more slowly. To gain speed for fast-flying aircraft, we turn to deep-pitched props rather than use high rpm to generate it.

Up-Front Expense

This is one of those differences that doesn't get discussed very often, but it's one of the first things a newcomer to electrics must deal with. Most guys interested in electrics are immediately concerned about the expense of a charger. Frankly, I don't understand this, as very good peak detect chargers carry street prices around $100, and most of the guys concerned about this cost are spending a whole lot more than that to feed their hobby.

Rather than concentrating on the charger, however, I think it's best to realize that when you get into electrics, you must buy the equivalent of what would be your fuel and glow plug supply for the next several years, pretty much in a lump sum, up front. From experience, I can tell you that this hurts. But, once you do it, you start feeling pretty good about it, as rapid-charge Ni-Cds that are properly cared for will fly your airplanes for many years and, in the end, this up-front expense more than pays for itself.

Along these lines, there's one thing that is very similar between electric power systems and glow and gas systems: if you buy cheap, you'll buy twice. Too often I see people "trying" electrics and failing because they believe they can fly 3- to 4-pound airplanes with a $15 electric motor with the same performance they expect from their $100 glow engine. It just doesn't work that way. Inexpensive electric motors have their place, but it's not as a 1:1 replacement of glow engines.

by HAL deBOLT

CLINTON DESOTO: AN R/C PIONEER

WE ARE REVIEWING the birth of R/C as we have found it. Last month, we discussed the details of Clinton DeSoto's efforts to achieve R/C flight. Recall that DeSoto's first vehicle was an 18-foot, 20-pound soaring glider. Gliders must be launched, so you can imagine what was needed to get such a monster airborne!

With "just the right weather," DeSoto and his team were able to heave the glider off a slope and obtain some short successful flights; however, they knew there had to be a better way to accomplish much more. The full-scale powered sailplanes that then came into vogue seemed to present a solution to launching the heavy R/C glider.

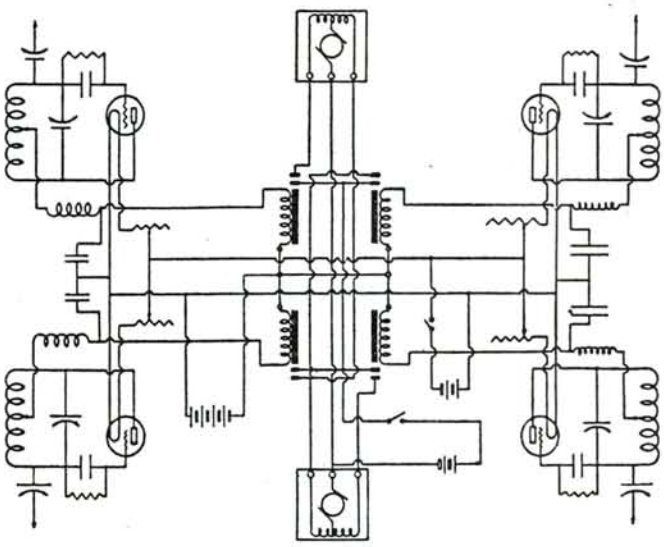
In short, a Forester "99" engine was mounted on a pylon above the wing in pusher fashion. Engine ignition "noise" plagued R/C until the advent of the glow plug. Because DeSoto placed the engine and its ignition in the pylon pod, interference was nil. DeSoto found another solution to noise interference: he held the receiver in his hand while the engine was running, he moved the receiver until no interference was noted, and then he installed the radio in that position. How do you like them apples?

DeSoto indicated that with the Forester engine, the glider flew off using the "run-and-heave" method and even managed to gain a bit of altitude. This allowed some R/C flying. Reports from a Harris Hill glider port event mentioned this and, as a youth, it was also my privilege to see the glider at this Harris Hill site.

DeSoto's efforts didn't stop there: he mentioned being able to reduce the airborne equipment weight from 5 to 3½ pounds.

Of major note is the project that gained him second place at the 1938 R/C Nats, the last DeSoto effort of which I am aware.

DeSoto was a dreamer who prophesied that R/C would be flown as we now do. Remember, until that time, "guided free flight" was all that had been seen. To land in the same field was a major achievement! Following his vision, DeSoto worked to achieve it as best he could. He knew that full controls were needed, yet only rudimentary single-channel was available. He built a 14-foot, 35-pound "Cub-like" model that he thought would be able to fly. Since engines were also in their infancy, where could he get enough power to lift 35 pounds? DeSoto persuaded Forester to build a Twin 99, which provided ample power.



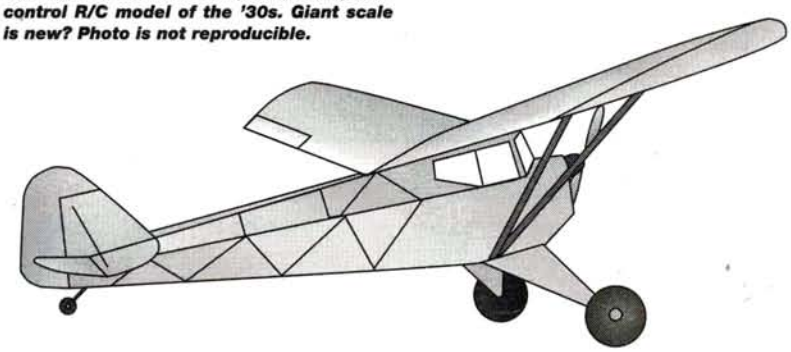
Schematic of DeSoto's four transmitter combo—all in one unit.

Full control meant rudder, elevator, ailerons and throttle. Multi-channel radios were far into the future, but DeSoto thought that four *single-channel* radios—on four different frequencies—would be able to handle all four functions.

To DeSoto's benefit, Robert Packard, a ham operator at the Raytheon Co., had just developed the first vacuum tube specifically for R/C, the RK62. This tube was a major step forward: a single-tube receiver was now possible, with even greater performance than the previous three-tuber. This made DeSoto's task more feasible! The arrival of the SIGMA mil-spec relay, with its precise operation and low-current requirements, was a distinct advantage.

The effort put into accomplishing DeSoto's vision is almost beyond comprehension! First, four transmitters on four separate frequencies (56.7, 57.9, 58.6 and 60MHz) were combined into one unit. Four "whip"-style antennas had to be arranged so that the signals wouldn't cross-mix. A separate control box had a toggle switch for each frequency. As you can imagine, things did not always work on the first try; DeSoto had to design and construct a second complex transmitter

Clinton DeSoto's 14-foot, 35-pound, full-control R/C model of the '30s. Giant scale is new? Photo is not reproducible.



before satisfactory performance could be achieved. A portable generator was necessary for the power requirements.

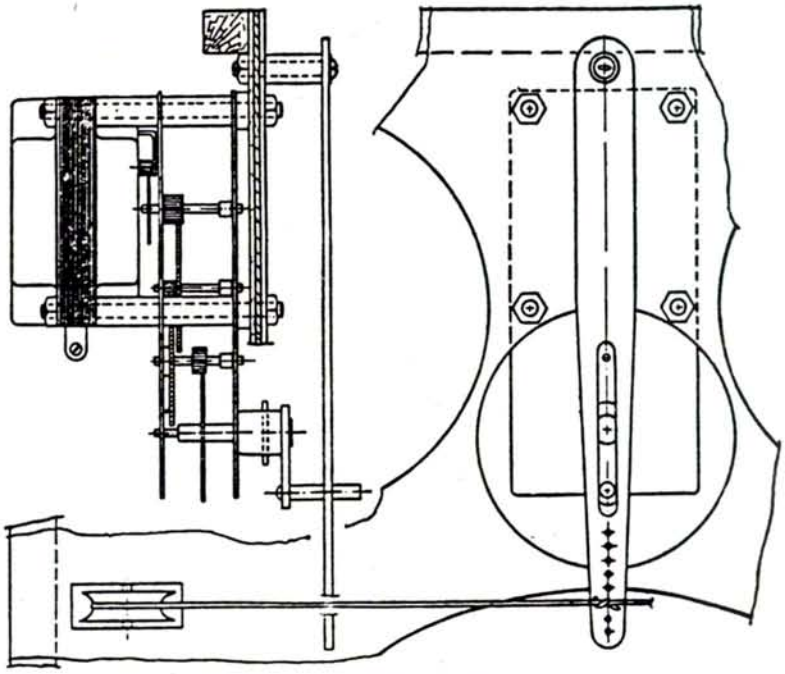
The airborne system also included four separate single-channel receivers incorporated into one unit. The RK62 was a godsend; with it, only four tubes were required. With the previous types, it would have been 12!

As with the transmitter, four receivers required four separate antennas and, again, cross-mixing was possible. The solution involved one vertical whip-style antenna, two others running out each wing panel and another back to the tail.

DeSoto had spent considerable time developing more suitable actuators, which were motor-driven gear trains. His glider experience had indicated that a much quicker response time would be an asset, so he reduced the gear ratio from 1,000:1 to 300:1. The output-to-control surface arrangement was also improved.

DeSoto perceived that something more precise than clockwork gear trains would be required. He found sources for gears and assembled the trains himself. The trains' intermediate gears were 30 teeth per inch—rather fine. Contemplating the heavy air loads on the gear, he reduced the final gears to 15 teeth per inch. Our current experiences suggest that he really was visionary in that respect!

The rudder actuator was coupled to a "walking beam"; steel wire control cables ran from it over pulleys to the rudder. So what's new today?

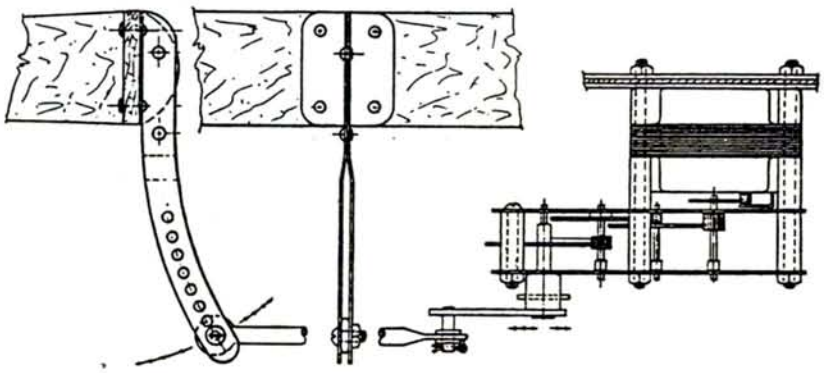


The DeSoto actuator used control cables for rudder action.

A similar actuator was used for elevator, only this time, the actuator output was an "arm" (aka a servo arm). A 3/16-inch aluminum-tube pushrod connected the arm to a substantial elevator horn. The aileron actuator wasn't mentioned, so I assume that it was similar.

To meet the weight rules at the 1938 Nats, DeSoto removed the aileron system and used rudder for steering.

Preflight and getting ready to fly this monster was another education. Remember, all early radios had to be "tuned" before operation and each flight. It was a chore with just one system, and DeSoto had four to deal with! The procedure was to tune the lowest frequency transmitter (there were no crystals!) and then tune one receiver to that transmitter; same procedure for the second, third and fourth transmitters. This had to be accomplished with the transmitters at some distance from the receiver; walkie-talkies would have simplified all that for sure!



The DeSoto elevator actuator used a pushrod. Note the complex control horn. Everything was handmade!

To keep all the transmitters and receivers coordinated with the desired control switches was cumbersome, so DeSoto added a switching mechanism to the control box so he could orient the switches with the desired control after the tuning hassle was over (I would bet the need for that came from experience!).

DeSoto's narrative is full of construction details but lacks accounts of flight experiences, so we can only speculate.

The fundamental flight method of the time was to allow the model to fly itself and then to guide it in the desired direction—DeSoto's actuators had no predetermined "neutral;" they simply cycled as long as a signal was present. With this mode, the craft was constantly changing direction. When it was headed as you wished, you would release the signal; the control position stayed until you desired a change. To change, the signal was held, the cycling went on until you saw what you wished and released the signal to hold that position—you hoped! How would you like to try that with a modern R/C model? Slow flight seemed to allow it, but how about doing it with four controls? Wow!

Today it may seem hard to comprehend what the dreams of modern R/C performance meant to our pioneers. The great desire was there, and the efforts to accomplish it seem unreal; and they had so little to work with!

LATEST PRODUCT RELEASES

SURE FLITE

Supermarine Spitfire

Sure Flite's new Spitfire kit features a larger wingspan and wing area; a main gear that is farther forward and has a wider track; a new vacuum-formed cowl with a plywood firewall; an engine location that has been moved forward for easier balancing and an enlarged horizontal stabilizer for better stability. Specifications: wingspan—57 inches; wing area—530 square inches; fuselage length—41 inches; engine required—.40 to .50 2-stroke or .40 or larger 4-stroke.

Sure Flite Enterprises, 571 Crane St., Bldg. H, Lake Elsinore, CA 92330; (909) 245-6343.

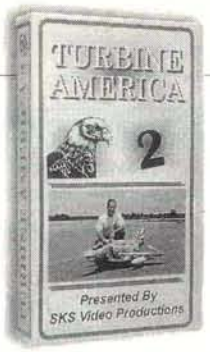
TNC ELECTRONICS

PT10S

The new TNC tachometer, the PT10S, is designed to replace the PT+10 model and features the ability to switch from a resolution of 100rpm to 10rpm. This allows the modeler to finely tune a rough-running engine. The PT10S also features: accuracy to 1rpm; a 10rpm mode that measures up to 60,000rpm and a 100rpm mode that measures past 150,000rpm. It is sensitive enough to operate on sunny and cloudy days, and it's free from calibration drift; it never requires calibration.

Price—$99.95.

TNC Electronics, 2 White's Ln., Woodstock, NY 12498; (914) 679-8549; fax (914) 679-5542.



SKS VIDEO PRODUCTIONS

"Turbine America 2"

"Turbine America 2" is SKS Video Productions' newest release that features more than 80 aircraft, including: Terry Nitsch's turbine-powered F-80C Shooting Star, CJM's F-4 and He 162 Salamander, Ron Doctorick's Twister, Wayne Jonre's "WAJ," Scott Harris's T2J Buckeye, Lynn Elston's twin-engine F-15 and Tim Redelman's Maverick Pro. Running time: 80 minutes.

Price—$19.95.

SKS Video Productions, R.D. #1, Box 264, Abbottstown, PA 17301; (800) 988-6488; outside U.S. (717) 259-7193; fax (717) 259-6379; website http//www.yorkpa.com/sks.

JACK STAFFORD MODELS

Rearwin Speedster

The Jack Stafford Models Rearwin Speedster features the sleek scale lines of its full-size counterpart, and it's quite a performer in the air. Builder-friendly construction is easy with the supplied fuselage jig and a host of precision laser-cut parts. Specifications: wingspan—60 inches; length—43 inches; wing area—597 square inches; weight—5 to 6 pounds; engine required—.40 to .65 2-stroke or .45 to .70 4-stroke.

Price—$119.95.

Jack Stafford Models, 383 W. Chicago Rd., Coldwater, MI 49036; (517) 279-9380; fax (517) 278-6576.

TEXAS TIMERS

Radial Engine Mount

Texas Timers announces the immediate availability of the first and only Radial Engine Mount designed expressly for the popular Norvel/AME .049/.061-size engines, including the new Mark III model and the Russian-made STELS engines of the same displacement. The Radial Engine Mount replaces the back crankcase cover and simply threads into the engine; no separate or additional engine mount is needed.

Price—$6.50.

Texas Timers, 3317 Pine Timbers Dr., Johnson City, TN 37604; phone/fax (423) 282-6423; website http://www.txtimer@tricon.net>.

Product NEWS

TOP FLITE

Corsair Updated

The updated Top Flite Gold Edition F4U Corsair kit features more scale realism and building ease. A highly detailed scale Corsair cockpit is available for the F4U's interior, and the firewall has right thrust built in. Also, a .60 to 1.20 engine mount is provided, and the kit has an updated instruction manual. For those who have the older Corsair kit, Top Flite offers an update kit that features these new changes.

Part nos. and prices: TOPA0101, Updated Gold Edition F4U Corsair .60—$249.99; TOPQ8404, Corsair cockpit kit—$19.99; TOPQ8060, Corsair update kit—$49.99.

Top Flite; distributed by Great Planes Model Distributors, 2904 Research Rd., Champaign, IL 61826-9021; (217) 398-6300; fax (217) 398-0008; website www.top-flite.com.

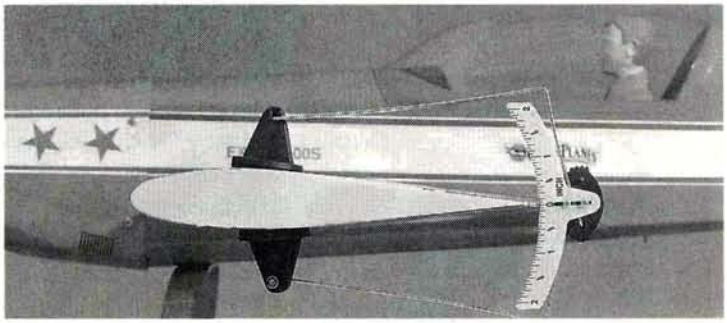
ARPI BOOKS

"Prop Talk"

"Prop Talk," by Donald W. Brooks, describes how to select the propeller that best matches a model's power system (i.e., motor, gearbox, battery combination) and also provides an optimum balance of launch/takeoff thrust and flight duration. An appendix lists the static thrust coefficients for more than 230 folding and fixed propellers. The book also includes the *Field Thrust Calculator for Electric Flyers*—a mechanical, hand-size chart calculator. A good book for all who fly electrics.

Price—$17.95 (plus $2.50 S&H).

ARPI Books, 900 Bower Dr., Idaho Falls, ID 83404.



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Great Planes Model Mfg. introduces the AccuThrow, a low-cost, easy-to-use control surface deflection meter that accurately measures the travel of your model's ailerons, elevator and rudder. This device will help you achieve the specified control surface movement before you take your precious model up into the sky. It features rubber feet, which protect your model's finish, and a curved measuring scale that reads in both standard and metric scales.

Part no.—GPMR2405; **price**—$14.99.

Great Planes Model Distributors, 2904 Research Rd., Champaign, IL 61826-9021; (217) 398-6300; fax (217) 398-0008; website www.greatplanes.com.

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Grumman F8F Bearcat

This new 1/12-scale kit features laser cut wooden parts; a complete hardware package featuring top-of-the-line Sig and Du-Bro items and Dave Brown wheels; a vacuum-formed canopy; detailed plans and instructions, and detailed 3-views. Specifications: wingspan—35½ inches; wing area—244 square inches; engine required—.10 to .25 2-stroke or .20 to .30 4-stroke; weight—1.5 to 3 pounds.

Price—$59.99 with combat hardware; $69.99 with sport hardware (plus $7 S&H).

Air-Kill Products, 14 Shady Lake Ct., Sacramento, CA 95834; (916) 425-9933.

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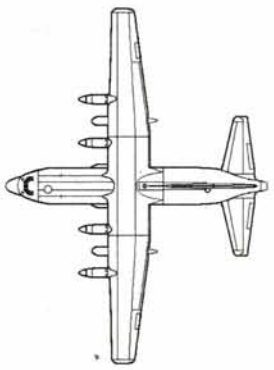

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Send your answer to *Model Airplane News*, **Name That Plane Contest** (state issue in which plane appeared), 100 East Ridge, Ridgefield, CT 06877-4606.

The winner will be drawn four weeks following publication from correct answers received (on a postcard delivered by U.S. Mail), and will receive a free one-year subscription to *Model Airplane News*. If already a subscriber, the winner will receive a free one-year extension of his subscription.

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Statement of Ownership, Management, and Circulation (Required by 39 U.S.C. 3685). 1. Title of Publication: MODEL AIRPLANE NEWS. 2. Publication no.: 533-470. 3. Date of Filing: October 1, 1997. 4. Frequency of Issue: Monthly. 5. Number of issues Published Annually: 12. 6. Annual Subscription Price: $39.95 7. Complete Mailing Address of Known Office of Publication: 100 East Ridge, Ridgefield, CT 06877-4606. 8. Complete Mailing Address of Headquarters or General Business Office of Publisher: Same. 9. Full Names and Complete Mailing Address of Publisher, Editor, and Managing Editor: Publisher: Louis V. DeFrancesco, 100 East Ridge, Ridgefield, CT 06877. Editor: Thomas Atwood, 100 East Ridge, Ridgefield, CT 06877-4606. Managing Editor: Larry Marshall, 100 East Ridge, Ridgefield, CT 06877-4606. 10. Owners: Grace V. DeFrancesco, Louis V. DeFrancesco, and Yvonne M. DeFrancesco, 100 East Ridge, Ridgefield, CT 06877-4606. 11. Known Bondholders, Mortgages, and Other Security Holders Owning or Holding 1 Percent or more of Total Amount of Bonds, Mortgages or Other Securities: None. 12. Does not apply. 13. Publication Name: MODEL AIRPLANE NEWS. 14. Issue Date for Circulation Data Below: November 1997. 15. Extent and Nature of Circulation: Average Number of Copies Each Issue During Preceding 12 Months: A. Total Number of Copies (Net Press Run): 130,920. B. Paid and/or Requested Circulation. (1) Sales through dealers and carriers, street vendors and counter sales: 23,829. (2) Mail Subscription (paid and/or requested): 56,805. C. Total Paid and/or Requested Circulation: 80,634. D. Free Distribution by Mail: 1,915. E. Free Distribution outside the Mail: 494. F. Total Free Distribution: 2,409. G. Total Distribution: 83,043. H. Copies Not Distributed: (1) Office Use, left over, spoiled after printing: 2,846. (2) Return from News Agents: 45,031. I. Total: 130,920. Percent Paid and/or Requested Circulation: 97.1% Actual number of copies of single issue Published Nearest to Filing Date. A. Total Number of Copies (Net Press Run): 128,680. B. Paid and/or Requested Circulation. (1) Sales through dealers and carriers, street vendors and counter sales: 23,878. (2) Mail Subscription (Paid and/or requested): 53,880. C. Total Paid and/or Requested Circulation: 77,758. D. Free Distribution by Mail: 1,477. E. Free Distribution outside the mail: 500. F. Total Free Distribution: 1977. G. Total Distribution: 79,735. H. Copies Not Distributed: (1) Office Use, left over, spoiled after printing: 4,587. (2) Return from News Agents: 44,358. I. Total: 128,680. Percent Paid and/or Requested Circulation: 97.5% This statement of ownership will be printed in the January issue of this publication.

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Slope Scale, 12935 Lasselle St., Moreno Valley, CA 92553; (909) 924-8409; email 102465.556 @compuserve.com. website http://ourworld.compuserve.com/homepages/slopescale.

SonicTronics, 7865 Mill Rd., Elkins Park, PA19027-2796; (215) 635-6520; fax (215) 635-4951.

Studio B Graphic Design, P.O. Box 514, Kurtistown, HI 96760-0514; (808) 968-8721; email studiob @aloha.net; website http://planet-hawaii.com/studiob.

Take Flight Model & Mold Inc., 5350 McIntosh Point, Ste. 120, Sanford, FL 32773; (407) 328-8124; fax (407) 328-8350.

The Birdworks, P.O. Box 1302, Port Orford, OR 97465; (503) 332-0194.

Top Flite; distributed by Great Planes Model Distributors (see address above).

Trick R/C, 938 Victoria Ave., Venice, CA 90291; (310) 301-1614; email Zod@zagi.com; website http://www.Zagi.com.

Ultracote; distributed by Carl Goldberg Models, 4734 W. Chicago Ave., Chicago, IL 60651.

Vortac Mfg. Co. Inc., P.O . Box 469, Oak Lawn, IL 60453; (708) 425-5885.

Wing Mfg. , 306 E. Simmons St., Galesburg, IL 61401; (309) 342-3009.

Zap-A-Dap-A-Goo, distributed by Zap Glue, 9420 Santa Anita Ave., Rancho Cucamonga, CA 91730.

Z-Poxy; distributed by Zap Glue, 9420 Santa Anita Ave., Rancho Cucamonga, CA 91730.

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MODEL AIRPLANE NEWS (ISSN 0026-7295, USPS 533-470) is published monthly by Air Age Inc., 100 East Ridge, Ridgefield, CT 06877-4606.

Periodical postage permit paid at Ridgefield, CT, and additional mailing offices.

SUBSCRIPTIONS. Call (800) 827-0323 or set your Web browser to http://www.airage.com/subscribe.html. U.S.: $39.95 for one year, $59.95 for two years. Canada: $56.66 for one year, $91.97 for two years (Canadian prices include G.S.T.). Elsewhere: $52.95 for one year, $85.95 for two years. Canadian G.S.T. registration no. 13075 4872 RT.

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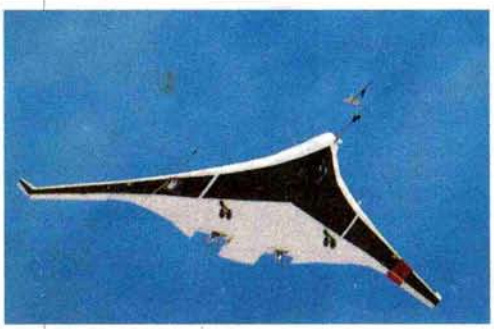
ADVERTISER INDEX

IT'S A BIRD ... IT'S A PLANE ...

What's radio controlled, weighs 120 pounds (54 kilograms), spans 17.7 feet (5.4 meters) and has no body or tail? It's the BWB-17 test bed, successfully flight-demonstrated recently in California.

The BWB (blended wing body) was built for NASA to demonstrate a dramatic concept from McDonnell Douglas (now merged with Boeing) that could revolutionize transport aircraft. The concept comes from considering how cargo is enclosed: current transports have large cylindrical fuselages whose outside area contributes drag even though it lifts very little. In contrast, the BWB repackages the cargo volume so that it is blended into the wing (hence the name) and contributes lift. The drag of the fuselage disappears, providing a higher efficiency airplane.



The 289-foot/88-meter-span BWB aircraft will carry 800 passengers more than 7,000 miles (11,000 kilometers) at 0.85 Mach (560mph/900kmph), with 27 percent less fuel consumption than a conventional wing and fuselage aircraft of the same capacity (note that 747s span 196 feet but carry half the passengers). The BWB is so efficient that only three 747 engines are needed, with intakes above the wing to minimize noise. Passengers sit in one of 10 side-by-side cabins arranged in double-deck compartments, and there's even a walkway at the BWB's leading edge for passengers to take a stroll and enjoy the view through a transparent leading edge!

The BWB concept is a dramatic change from what we're used to! Like any new idea, it has to fly to convince people it's viable. Collaboration among Stanford University, NASA and McDonnell Douglas developed the flying test bed model, which is scaled to study low-speed characteristics and flight-control concepts for future BWBs.

DESIGN FEATURES

The BWB model was scaled to match the full-size airplane configuration (except for lower-speed airfoil sections) and designed and built at Stanford University. Power is provided by a pair of 2-stroke O.S. BGX-1 engines with custom pusher propellers sized to match the full-size airplane's thrust-to-weight ratio. The airframe was assembled from blocks, cut by a numerically controlled hot-wire foam cutter, which were epoxied to an aluminum and steel frame and fiberglassed. The outer wing panels separate from the center section for transport.

Thirteen conventional control surfaces are hinged along the trailing edge; split drag rudders are on the outer wing panels (two servos each). Three more servos control dual throttles and nose-wheel steering. The key to managing these 18 Futaba* S-9402 servos is an onboard computer that combines pilot commands from a JR PCM-10 with onboard sensor inputs (airspeed, flight angles and rates), updating the servos 20 times each second to stabilize the aircraft. The flight-control rules were developed through a combination of computer simulation and pilot-controlled captive testing. An onboard video transmitter and data recording system provide an airborne view, and flight data are available immediately after landing. Control rules may be updated in minutes using a portable computer.

TESTING AND SIMULATION

The BWB test bed was developed using computer simulations and ground testing. BWB R/C glider experience was combined with computational aerodynamics for the control design. For ground testing, the BWB was attached to a mast mounted above an automobile, free to pivot in pitch, roll and yaw. A pilot "flew" the airplane on the mount, with the car moving at flight speeds (a simple way to try out control rules and gain experience). A conventionally configured airplane matching the BWB's size, weight and power was developed to train the pilot and flight team in operational techniques.

Boeing's Blaine Rawdon configured the BWB (he also designed the Mirage sailplane and markets model design software). Investigators included Stanford's Ben Tigner and Ilan Kroo, and the BWB was piloted by Bill Watson (known for his model-making and special-effects work for the movie industry).

THE FUTURE

This test bed is the first step in a BWB development program. The next step uses a larger, jet-powered, manned aircraft to enlarge the flight envelope, increasing speed to investigate actual aerodynamics, performance, and potential noise issues. The BWB team is anxiously awaiting a go-ahead from NASA to continue this exciting effort!

—Don Edberg

**Addresses are listed alphabetically in the Index of Manufacturers on page 158.* +

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